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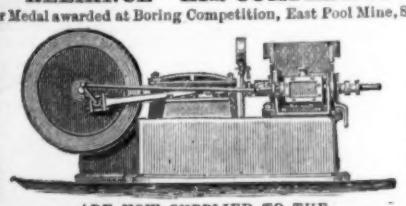

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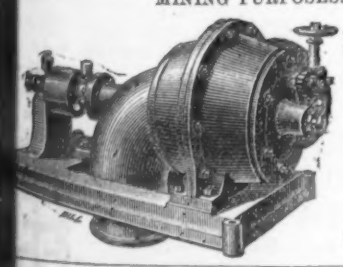

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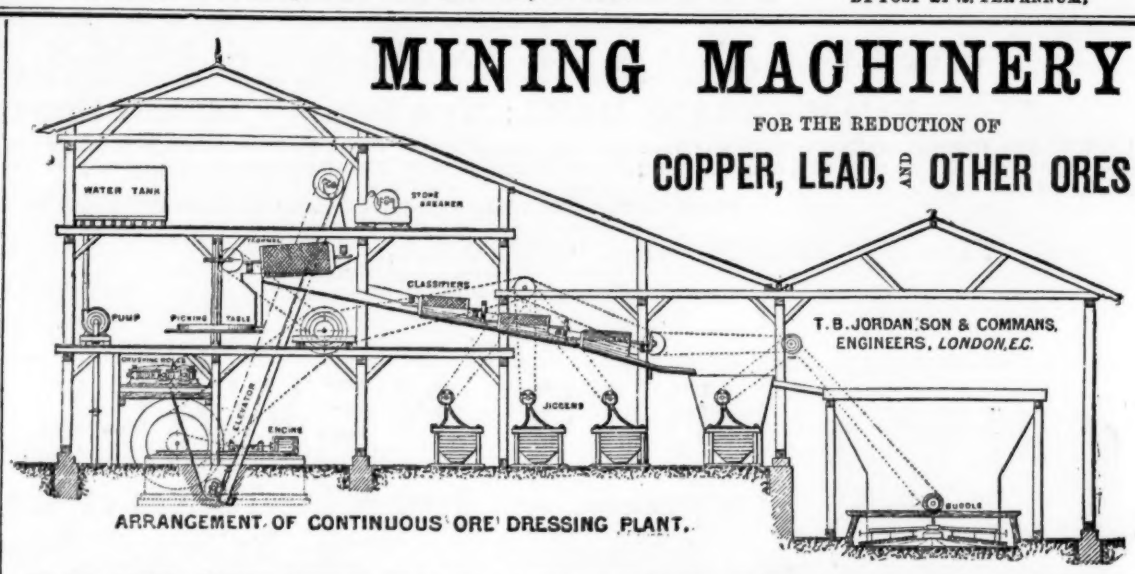

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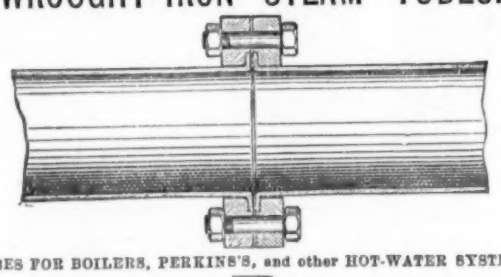

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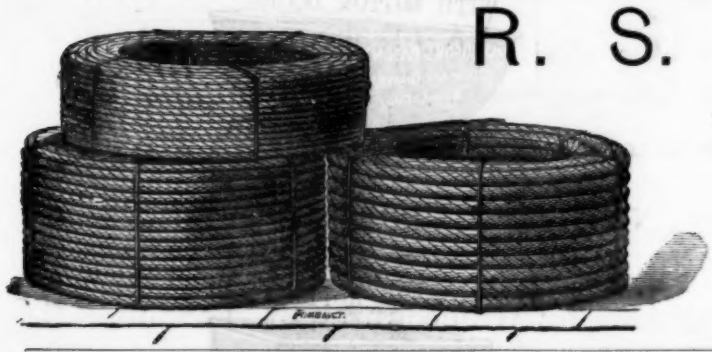

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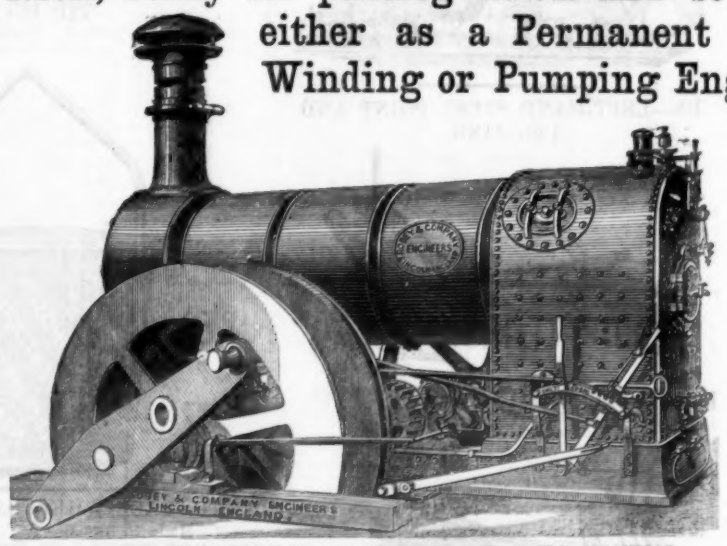

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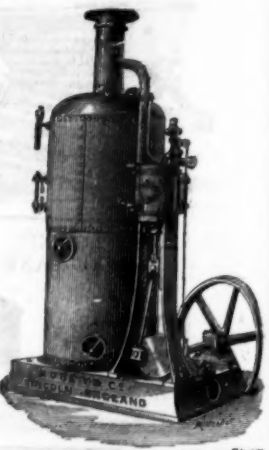

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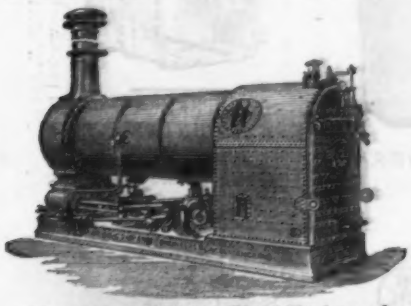

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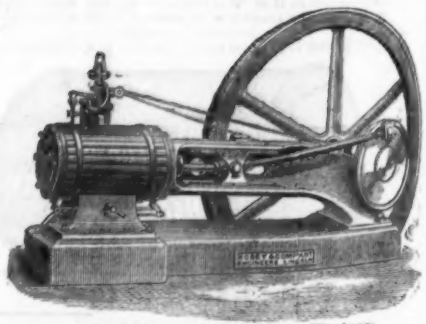

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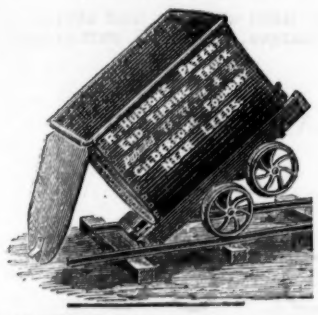
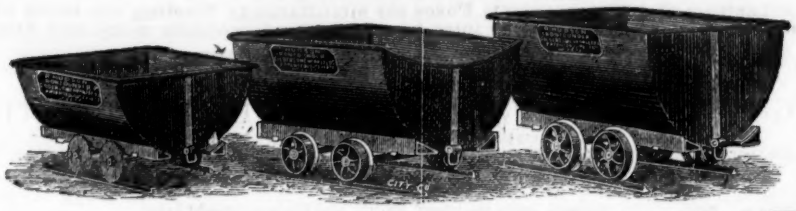
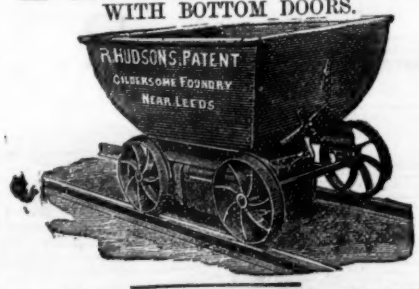


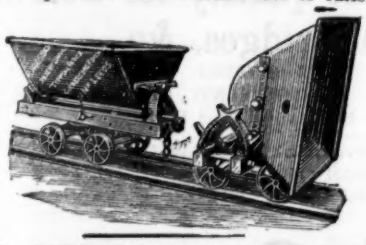
7.—PATENT STEEL MINING WAGONS.



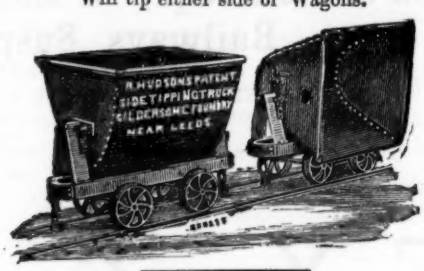
12.—PATENT STEEL HOPPER WAGON, WITH BOTTOM DOORS.



2. PATENT UNIVERSAL TRIPLE-CENTRE STEEL TIPPING TRUCK,
Will tip either SIDE or either END of rails.

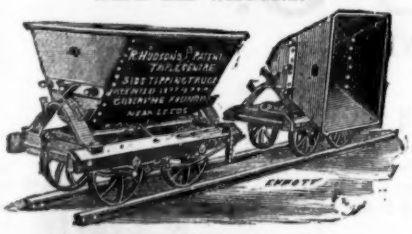


8.—PATENT DOUBLE-CENTRE STEEL SIDE TIP WAGONS,
Will tip either side of Wagons.

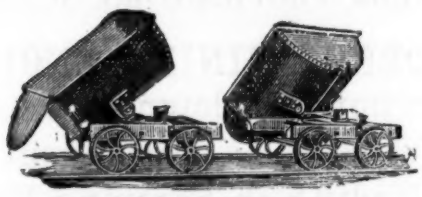


13.—PATENT STEEL HOPPER WAGON.

3.—PATENT TRIPLE-CENTRE STEEL SIDE TIP WAGONS.

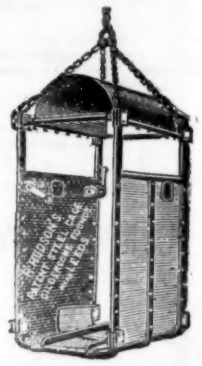


9.—PATENT STEEL ALL-ROUND TIP WAGON.

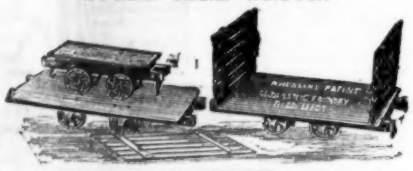


14.—SELF-RIGHTING STEEL TIP BUCKET.
(The "CATCH" can also be made SELF-ACTING if desired.)

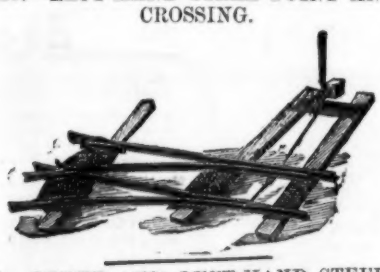
15.—STEEL CAGE.



4. -PATENT STEEL PLATFORM OR SUGAR CANE WAGON.



10.—LEFT-HAND STEEL POINT AND CROSSING.



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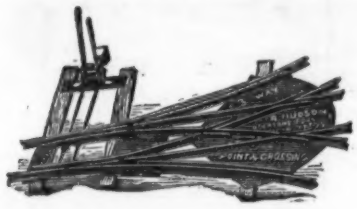

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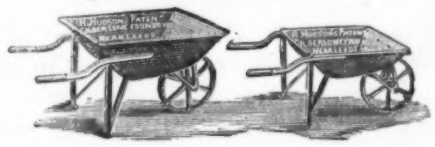

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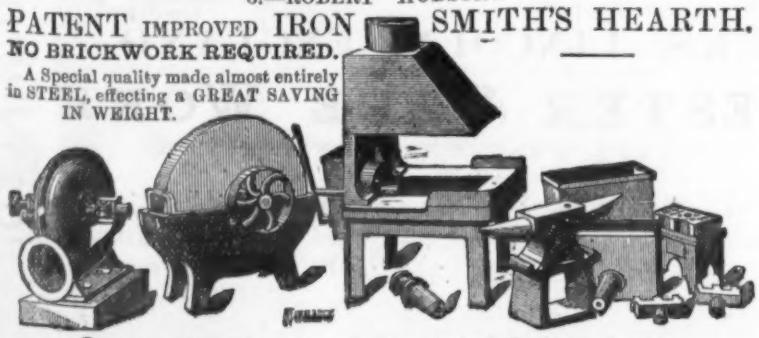

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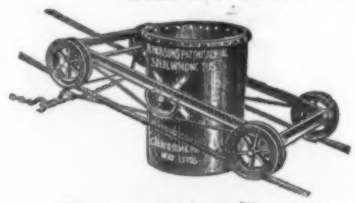

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We also solicit attention to the following articles, which, in addition to our well-known Patent Steel Wheels and Axles, we are also now largely supplying in our CAST STEEL, on account of their great strength combined with durability and lightness.

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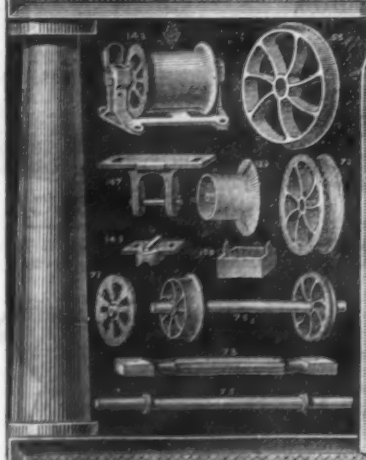
NOTE.—Beware of spurious and cheap imitations, we are constantly replacing such. See therefore that Hadfield's name is on every wheel.

The above sketch shows a tensile specimen (one-third full size,) turned out of one of Hadfield's unhammered Steel Castings, tested by H.M. Govt. and stood 45 tons per square inch, tensile strain, and 20 per cent. elongation. Our raw material, and finished Steel Castings are subject to strict chemical analyses, and tested for mechanical strength by H.M.Govt., Kirkaldy, Admiralty, Profs. Kennedy, Huntington, &c., giving tensile strains of from 32 to 65 tons per square inch, (varying according to purpose required) and up to 20 per cent elongation.

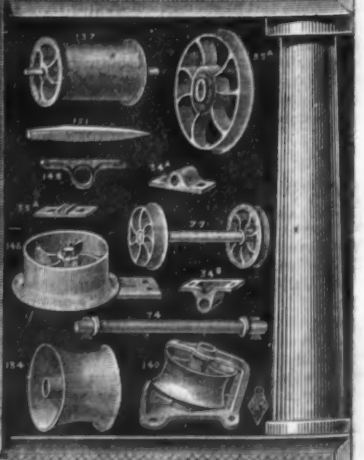
OVER 1100 · DIFFERENT · WHEEL · PATTERNS · IN · STOCK



HECLA STEEL FOUNDRY

STEEL CASTINGS

ATTERCLIFFE SHEFFIELD.



REGISTERED TELEGRAPHIC ADDRESS: HADFIELD SHEFFIELD

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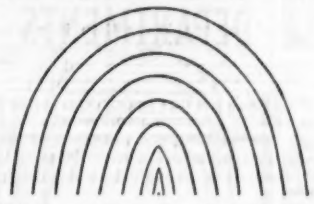
Original Correspondence.

THE GOLDEN QUARTZ REEFS OF AUSTRALIA.—No. VI.

SIR,—Strata.—The accurately surveyed transverse geological sections of the Bendigo gold field would decide whether or not the quartz reefs are in a lower silurian basin of corrugated and fractured strata, the eastern edge of which lies to the east of the Hustler's line of reefs, and the western edge to the west of the New Chum and Victoria line of reefs. Possibly the whole of the strata with its corrugations and contortions is dipping continuously to the west, and the beds in which the auriferous reefs occur, have to the west of the three great lines of reefs, gone down to great depths far below the surface. To the west very little mining has been done, and only the shallow ground tried, so that it is quite an open question what may there exist. The general dip of the strata (I am now using this word dip in a broad geological sense, what miners call underlie) may be in the opposite direction to the east, and this view might be supported by the proximity of the granite range on the west. On the whole of the strata on this gold field may form a great corrugated anticlial—and not a basin—the apex of which may prove to extend from the Hustler's to the New Chum and Victoria Reefs, the strata having a general dip to the east and to the west of the last-named lines of reef. A careful geological section would do away with the necessity for such hypothesis in order to provide some reasonable explanation for the existence of rich and poor parallel quartz reef in close proxmity to each other. With the facts at present available we may assume that the three great master reefs of Bendigo occur in the same beds; that is to say, the same beds that contain rich quartz reefs in the Garden Gully line also contain rich reefs in the Hustler's and New Chum and Victoria lines. Believing, as I do, that a thorough survey and record of the modes of occurrence of quartz reefs on Bendigo will make clear many points of great importance to the economic mining of quartz reefs in other gold fields in Australia and in other countries I am, and have been, for a great many years most anxious that such information shall be placed in the hands of the Bendigo miners, and be made available to all those persons interested in the development of quartz reefs in other parts of the world.

Form of Reefs.—The pioneer quartz miners of Bendigo will recollect that the outcropping saddle-formed reefs had the crescent form, and that they were parallel with the strata above and below them. To the miners of the present time operating on reefs at 1000 ft. or more below the surface this statement may appear doubtful, because the reefs now in work are of the inverted V (Λ) form. A little thoughtful consideration of this subject will, I think, however, convince them that such must have been the case. And that the Λ-formed or fractured reefs must necessarily exist under the crescent formed reefs. For example, in this figure (No. 23) I have marked



on a vertical line nine points at equal distances apart; at the sixth from the top I have made five similar points to the left and five to the right, and then sketched lines connecting the several points on the vertical and horizontal lines, and produced these curved lines to a level with the ninth point. Now, let us assume that the spaces between these lines represent beds of slate and sandstone, and counting them from the top we have five beds produced; but we now find on the bottom line in the centre only space for one more bed, whereas there are three beds or layers of slate and sandstone to be crushed into the space of one. This being impossible, the natural consequence of such corrugation of the strata was they were fractured and dislocated or faulted. Slide lines were formed and portions of the strata thrust upward towards the surface, where the pressure would be least. Under these circumstances the broken strata came together in the inverted V (Λ) shape. And as the reefs grew in the form of the crescent where the strata were undisturbed near the surface so did they assume the Λ shape in accordance with the form of the broken strata in which they are found at deep levels. There cannot be any doubt the quartz reefs have in shape very often conformed to that of the bounding strata in which they occur, whatever may have been the mode or manner of their origin and construction. To do so in very many cases they have made a hard struggle under evidently disadvantageous circumstances, and have not succeeded, although the evidence of the attempt is frequently visible in their margins or walls.

To make a forecast of the form of the reefs at greater depths than have yet been attained in Bendigo is a pure piece of speculation; but if we take the strata for our guide, then it may be assumed that the strata will gradually get less fractured and the reefs be formed with greater uniformity in shape and probably of less and less acute Λ forms. But as I have just said this is a subject of pure speculation as to what forms the reefs will assume below 4000, 5000, or 6000 ft. in depth, and there is not much instruction to be derived by dwelling on it at further length. My object in referring to this subject is simply to broach the idea of the existence of quartz reefs at such depths, and to familiarise the subject to men's minds. I have little doubt that undisturbed zones like those in which the perfect crescent-formed saddle reefs occur, will be found to overlie disturbed zones in which inverted V (Λ) shaped reefs exist, and that the latter will overlie in turn other undisturbed zones, and that these zones of broken and unbroken reefs will merge vertically one into the other more or less abruptly—the existence of the one kind of zone being a necessary sequence to those of a different kind over and under ying it.

Strata, and Reefs, and Water.—In the last two paragraphs I have curtly dealt with "strata and form of reefs," and shown how much the latter depends on the former. They are indisolubly combined in every way, and the sooner miners grasp this view the better will it be for themselves and for those persons who invest their capital in mining. It would not be more absurd for medical students to attempt to study the ramifications and phenomena of human veins without regard to the human body than for miners to try and study the veins running through the strata and rocks without regard to the strata and rocks. They are as inseparably connected, and there is a closer relationship between these two systems of veins than is generally supposed. In the one circulates blood, in the other mineral and acid waters. Some few years since in one of my lectures at the Bendigo School of Mines I ventured to show the similarity between these two systems somewhat in detail, and stated that so surely as you killed a man by draining his veins of blood, so would you as certainly kill a quartz reef by draining it of its mineral waters, and that decomposition of their vital parts would in each case immediately begin. Miners' technical language leads one to thing they have been obliged to connect the two ideas. For example, you will frequently hear miners speak of "bleeding" a reef when they strike a small vein; and of a still smaller vein (capillaries I call them) "weeping" when cut. I have also heard "jugular" used; but as it was only on one occasion, and then for my particular benefit, I cannot fairly include this term yet in a glossary. After the course of lectures just mentioned, I happened to visit a mine where evidently some of the miners had carried away one idea, at any rate, for on my way back to the shaft I passed a drive where I saw a man's figure bent over a winze, and heard him calling to his mate below very distinctly—"Have'e cut the jugliar yet, yon." We were, I believe, both pleased at the remark. Between each of the three great master reefs of Bendigo it is probable there exist two or more circulating belts of reefs quite independent of one another. The cross, *i.e.*, east and west, joints or fractures do not, as a rule, continue any very great distance; sufficient, for example, to connect drainage systems or belts of circulation, and cause an interchange of waters between reefs distant over 300 yards from each other. And there are no cross reefs or veins intersecting the reefs and strata. There are in some cases very indirect connections between belts of reefs, as is proved by the pumping operations on one reef gradually reducing or lowering the water in another running parallel to it. Yet the water in one reef will stand many hundreds of feet higher in that reef than in another, although only a few hundreds of feet of strata separates them from one another. Some time since Mr. Lansell cut a drainage belt in an eastern cross-cut from his deep shaft on the New Chum line of reef, and the pressure of water was so great as to flood the whole of the mines on this reef for a considerable distance. A dam was built in this cross-cut and the water was kept back—this not being an isolated case, although the effects are rarely so disastrous as in this example. Cross-cuts carried out far to the east or west of any of the deep shafts are very likely to cut water in considerable volume, and under great pressure.

Fossils.—Although I never found any graptolites on the Garden Gully Reef, I did find graptolites (didymographens) fruticosus in the mullock or waste heaps of the Paddy's Gully Reef in its vicinity. I have also found these same kind of graptolites on the Hustler's Reef extension to the north, and I now remember finding them on the Specimen Hill, Eagle Reef, which is believed to be the continuation of the Garden Gully Reef, three miles to the north of the Garden Gully Company's Mine. In each case I found the fossils in the waste heaps of the old shafts first sunk on the reefs. Below the water level it is rarely that such fossils are ever found. Above that level the black slate beds in which they commonly occur are more or less decomposed, even in some cases to a greyish white or pipe-clay colour, in which the graptolites can only be seen by placing them in certain favourable lights, when they are visible through their silvery micaceous reflection. In the lesser decomposed black slates they usually retain their black colour longer than the clay slate, and, consequently, are easily discovered through the strong contrast between them and the lighter background of the clay slates.

Minerals.—The richest deposits of gold have been found to occur in conjunction with soft black carbonaceous slates in this reef. Iron pyrites occurs in the slate bounding rocks and in the quartz. The pyrites saved by the Garden Gully Company has yielded from 2 up to 6 ozs. and more per ton. They usually treat about 400 tons of pyrites per annum. Calcite also occurs in this reef and galena, but not in such quantities as pyrites (iron and arsenical) or zinc blende. Pyrites is the most abundant mineral in the reef, and of it they obtain on an average about 1 ton from 80 tons of quartz crushed. Galena may be seen embedded in arsenical pyrites as well as gold. Gold is also visible in association with the pyrites, zinc blende and galena. In the legs the quartz is laminated by black polished (slickenside) carbonaceous clay slate in very many places. In the laminæ occur arsenical pyrites, zinc blende, gold, and rarely acriular crystals of stibnite. These minerals and gold are also found scattered in patches through the solid stone and in small cavities. Thin veins of calcite sometimes traverses the laminæ and the quartz of the reef, these thin veins being often about ½ in. in thickness.

Melbourne, Aug. 28. WM. NICHOLA F.G.S.
Consulting Mining Engineer.

SILVER MINING—NEW SOUTH WALES.

SIR,—The successful starting of the first silver smelting furnace in these colonies, may, possibly, be of sufficient interest to your readers to warrant the insertion of the account of it [published in another column] from the Sydney Daily Telegraph. I have no present means of verifying any of the statements, but I think, from what I have heard from parties who profess to know the mine, that the quantity of tailings (20,000 tons) is over-estimated considerably. There are other claims, beyond those above referred to, at work, though very little is really known in Sydney as to what they are doing, and I hear also that one, if not two, Mitchell's Creek mines are to be offered to the English public. Should such be the case let the purchasers have the titles most strictly investigated by some able attorney, as one or two are known to be open to question, and it is very possible that a strict examination would also prove others to be in a like category.

Unfortunately Dr. Robertson, F.R.G.S. (an English expert) is at present in Victoria, else I might, perhaps, have been able to get his opinion of the district and its prospects, which would have been of value to home investors.—*Sydney, Sept.* 4. R. D. A.

ENGLISH CAPITAL IN AMERICAN AND MEXICAN MINES.

SIR,—Why is it that all of the English mining companies pay three or four times as much for mines in the United States and in Mexico as are asked from other parties? Scores of mines in America are offered for sale for 4000*l.* to 25,000*l.*, and at these figures the mines are a safe and valuable investment; but the moment an agent appears of an English company the price is advanced to 100,000*l.*, and from that to 500,000*l.*, and too often the sale is consummated. To the candid honest American or Mexican mineowner these facts are a source of sincere regret. In any new industry like mining, for it is yet in its infancy, to see any man or company pay 10 times the value of his purchase is to be greatly deprecated. The writer has seen many mines on the Pacific Coast and in Mexico that were held for from 2000*l.* up to 40,000*l.*, which were more or less developed, many with good mills or reduction-works, that when the attention of English capitalists were called to them, the price was at once put up to 40,000*l.*, and from that to 500,000*l.* The expert sent reports favourably, the mine is sold and paid for, and then in two, three, or five years the stockholders wonder why the mine does not pay dividends upon the immense and over capitalisation, which cannot be done, but if the former prices had been paid the mine could and would have paid large dividends on the small capital invested. There are scores if not hundreds of mines, some perhaps only good prospects, owned by parties too poor to develope them properly or to put a mill on them, which can be bought to-day for from 2000*l.* to 10,000*l.* A good 10-stamp quartz mill for free gold ores, capable of reducing 1 ton per hour, can be built almost anywhere in the United States for 2000*l.*, and with all of the appliances necessary for working certain classes of refractory ores for 3000*l.* The mine can be well equipped with steam-drills, hoisting works, pumps, &c., for 1000*l.* Then here you have the mine and mill first-class in every regard for the small sum of 5000*l.*; another 1000*l.* added as working capital, and you have enough. The mine will easily produce 20 tons of ore per day; the average amount that the mill can and will crush. The ore will pay at least 2*l.* per ton, or 40*l.* per day of 24 hours. The expenses all told of mining and milling the ore will not exceed 1*l.* per ton. This counts in every item of expense necessary, which leaves a profit of 20*l.* per day, or 6000*l.* per annum on the whole of the capital invested. I think that I can name 20 such mines in California alone, and as many more here in Mexico. The same rule applies to the larger mine that will command 10,000*l.*, the mill 5000*l.*, and to equip the mine 2000*l.*, working capital 2000*l.*, or a total of (say) 20,000*l.* The ore free gold will pay 2*l.* per ton. The mill will crush 50 tons per day, equal to 100*l.* production every 24 hours, at an expense of not to exceed 40*l.* per day, leaving a profit of 60*l.* per day, or 18,000*l.* per annum; the entire capital invested, less the 2000*l.* as extra working capital. These figures are confirmed in almost every small well-managed mine on the Pacific Coast. Then why organise with 500,000*l.* capital, and pay three-quarters of it for a mine worth only one-quarter of it? The estimates here given will not it is true purchase such mines as the Sierra Buttes, Plumas National, Ontario, Horn Silver, Drum Lummon, Silver King, and others that have already produced millions in bullion, and easily turn out from 10,000*l.* to 20,000*l.* per month free of expense, though all of these do not do this at the present time. The ore of some of these here named pays less than 1*l.* per ton—the Sierra Buttes for instance. The famous Guyan Mine, of California, with 80 stamps paid regular dividends on ore that only paid 14*s.* per ton for three years.

The cost of mining ore in the Boston Mine, California, was 5*s.* per ton, and the milling was done for 2*s.* 3*d.* per ton, and this too in a 20-stamp mill run by water-power; expense of power 1*l.* 6*s.* per day, and includes all the expense of manager, mill help, board, assayer, and assay office (where 18 assays were made daily for the mill alone), wear and tear, oil, lights, renewals, &c. This mill was taken by the United States Mint as the model mill of the State. We could give many other illustrations if necessary.

If English mining company projectors, capitalists, and stockholders only knew the very low price at which scores of mines that promise well are held by the owners they would hesitate some time before they would pay such enormous sums for them, and it would put an end to the middle men and their profits in selling mines. In this section a step is being taken in the right direction. A strong English company has sent a very careful and competent man here to examine the properties held for sale, and he is negociating for some of the very best properties in the country, among which are the fine mica mines, which just now are the centre of so much interest, and from which the large slab of pure clear mica, 3 ft. square and 6 in. thick, was taken; also the rich nickel mines discovered a year ago, the great tin mine just discovered (the vein of which is from 10 to 12 ft. wide), and two gold properties—one of ten mines with a fine new mill, and another of two mines with a good mill—for all of which he will not pay as much as your ordinary mining companies are capitalised at. He is also negociating for one of the finest valleys in Mexico, 16 miles in length by 4 to 8 miles wide—640,000 acres—with more than 40 springs of water, and five ranches or farms, all of which he gets for 20,000*l.*; its actual value to-day for raising cattle is at least 200,000*l.* The company purpose to put on 4000 young cows the coming winter. The valley will support 10,000 head of cattle. This whole country is full of just such chances to purchase mines and other properties for almost nothing. Again, then, at least 10,000 good promising veins of copper, gold, silver, lead, nickel, and iron ore never yet located or denounced, and open to anyone who comes, the assays of which show the ore to be very rich on top at least: 1000*l.* placed in careful honest hands would secure, open, and prove two, three, or more of these veins. Then why, in the name of reason, should English capitalists pay such enormous prices for any more American or Mexican mines?

The famous old San Nicolas and San Francisco Mines near here, and for which an English and French Company offered 300,000*l.*, can be bought to-day for 40,000*l.* cash, all equipped with fine 10-stamp mill, hoisting-works, tools, buildings, &c. Litigation and wretched management prevented the consummation of the former sale. The Silver King, lead and silver—24 per cent. lead and 40 to 60 ozs. silver, with from 1*l.* to 2*l.* per ton in gold—situated near the Mexican Boundary Line, on a splendid wagon road, wood and water plenty and near at hand, can be purchased for 2000*l.* cash. It has neither mill or furnace. A good 10-ton per day water-jacket furnace can be placed on the property for 2000*l.* The vein is from 8 to 20 ft. wide. It is in the United States. The Socorro Mine, in Baja California (free gold, 4*l.* per ton) can be had for 2000*l.* A Dyer cannon-ball quartz mill, the best mill for new mines in America, to crush 1 ton per hour, can be built for 1000*l.* I could name scores of other mines cheap and good if necessary. D. K. ALLEN.

Real del Castillo, Baja California, Sept. 1.

THE VIRGINIA TIN MINES.

SIR,—A little over a year ago a startling announcement was made that very rich deposits of tin ore had been discovered in the Blue Ridge Mountains. Prospecting began at once, and it was found that the ore belt extended for at least several miles in a north-east and south-west course, and a mile or more in width. The principal body of the ore, so far as is known, is in the high ridges or mountains on both sides of Irish Creek, in Rockbridge county, about 8 miles from the Shenandoah Valley railroad at Vesuvius depôt, and about 20 miles from Lexington. Irish Creek is a bold, rapid stream, affording a never-failing and abundant supply of water. The fall is so great that the water can be utilised over again at short intervals. There are several saw and grist mills which now derive their motive power from this stream. The valley of the creek, though narrow, affords plenty of space for the erection of stamping mills and other machinery required in concentrating the tin ores preparatory to their being put into the smelting furnace. The mountain sides are covered with a heavy forest growth, and will furnish an abundant supply of timber for mining purposes as well as for charcoal. The mountains on both sides of Irish Creek rise to a height of from 300 to 1000 ft. above the level of the stream, and are generally very precipitous. The soil on these mountain slopes is wonderfully rich, producing without fertilisers large crops of the finest tobacco, corn, wheat, rye, oats, and potatoes.

On the eastern slope of the Blue Ridge, in Nelson county, and about 10 miles from the tin mines, there is a most remarkable deposit of the rare mineral known as "allanite." This mineral was discovered by Mr. Thomas Massie, to whom also is due the credit of first bringing to light the existence of tin ore on Irish Creek. Mr. Massie is quite an enthusiastic amateur mineralogist, and has devoted a good deal of time to "picking rocks," as some of his neighbours disrespectfully term his researches. I am indebted to him for a beautiful specimen of allanite, which is about 6 in. in length by 4 in. in breadth, and 1½ in. thick, without a flaw.

But to return to the more important subject of tin. The first work of development was done just where the first specimen was found—on the side of a hill some 20 or 30 ft. above a small branch of Irish Creek. Here the ore or tinstone appears in the form of a pure and rich cassiterite, narrow veins of which permeate the whole formation to a width of some 40 ft. or more. The openings at this point are in almost solid rock from 3 to 6 ft. deep. Besides these seams or veins of cassiterite there is more or less tin ore disseminated through the accompanying quartz and mica slate. Many crystals are also found in this deposit. What the average percentage of metallic tin in this deposit is I cannot say, but it is unquestionably good—much higher than is often found in tin mines even at very great depths. About ¾ of a mile from the above-mentioned deposit, in a south-westerly direction, three other openings have been made quite near together. These openings are near the summit of a high ridge on the opposite side of the little stream from the one first described. Whether the two have any close connection has not yet been determined. One of these openings on the ridge shows a section of what appears to be a regular vein of very pure and rich tinstone about 2 ft. in width. A trench has been cut across the vein to a depth of several feet, and about 3 ft. wide, which, of course, shows on that much of the vein in length. But the two other openings also show ore of the same character and equally rich, thus proving that the vein extends considerably beyond the first trench, though it may not be a continuous or unbroken one. The evidence is conclusive that here is a valuable deposit of very rich tin ore, and that the quantity is considerable. Some of the specimens from this deposit, I am informed, yield very nearly or quite 70 per cent. of metallic tin, but I have no information as to the average yield of the whole mass of the ore or vein matter. These deposits are on what is known as the Cash tract, which is controlled by Mr. Massie and his associates. Some surface openings have also been made by these parties in a north-easterly direction in which it is said tin ore has been found, but I have not examined them. Capt. Edgar Whitehead, at Amherst Courthouse, represents this property.

Immediately adjoining the Cash tract, from the summit of the mountain down to the creek and across it to the summit on that side in a south-westerly course, are the Grant and other lands which have been extensively prospected by the Robertson Brothers, of Lynchburg. These lands, covering about 1000 acres, reach entirely across the tin belt so far as it is known to exist. In one section of this block on the north-west side of Irish Creek, known as Mount Maria, embracing about 60 acres, 18 distinct parallel veins and several cross veins have been opened, in all of which the ore has yielded more or less tin; besides which several other similar veins have been located, but not yet tested for tin. Most of these veins have been traced for the greater part of the entire distance across the mountain from base to base, and several of them have been opened by cross trenches and shafts or tunnels at a number of points. On one of these a tunnel has been run to the extent of more than 80 ft. The geological formation and the character of the veins lead to the expectation that many of them will come together not very far below the surface, and indicate the presence of large bodies of valuable ore at no great depth. Under similar conditions in the Cornwall and other mines such a result is always looked for with the utmost confidence. Where these veins come together it is expected to find large bodies of rich ore, and it is a rare exception where this is not the case. These veins vary in width from a few inches at the surface to about 10 ft., and are generally nearly vertical. The ore yields in the laboratory from

a trace to 3½ per cent. of metallic tin. Mount Maria is from 300 to 400 ft. above the level of Irish Creek.

On the south-east or left bank of Irish Creek, running back to the summit of the mountain on that side, coterminous with the line of the Cash tract, and across the summit, extending in a south-westerly course for about 1½ mile, is another large section of this block. This tract approaches to within 250 yards of the second opening described above on the Cash land, and the vein or veins found there must project into it. This whole section, covering about 800 acres, is one high mountain, the summit of which is, by barometric measurement, 700 ft. above the level of the creek, and the ore crops out on both sides of it through the whole extent. A vein 4 ft. wide has been opened on this tract about 50 ft. from the Cash line, and in the direction of the openings there made. About 300 yards further in the same (south-west) direction another vein has been opened which is about 1 foot wide at the surface. In a spur or ridge running towards the creek from this last-mentioned opening seven distinct veins have been discovered and proved by numerous openings. One of these veins is from 1 to 1½ ft. in width, and the ore yields 5½ per cent. of metallic tin. The vein has been opened at several points, and a shaft sunk in it to the depth of about 30 ft. The south-west end of this tract is locally known as the Big Hill. On it ten parallel and two cross veins have been partially uncovered, and show the presence of tin in the ore. One of these veins has been opened about half way up the hill from the creek, and measures 2 ft. in width. By a rough test the ore from this vein yielded about 5½ per cent. of metallic tin within 1 foot of the surface. Near the summit of the hill is another vein parallel to this one. Several hundred yards further on to the south-west are two other parallel veins, one near the summit and one near the foot of the mountain. And still further on in the same course are two other parallel veins, one near the foot and another near the summit with a large quantity of float ore between indicating the presence of other parallel or cross veins.

On a ridge or spur running to the creek a little to the north of the veins above mentioned three parallel and one cross veins have been discovered and opened, while several others have been located but not opened. On the south-east side of Big Hill two parallel veins have been opened, and several others located. This Big Hill is chock full of ore with parallel and cross veins at short intervals through its whole extent. At its foot is a beautiful site for concentrating smelting works with water power from the creek. I have endeavoured to describe such portions of the tin belt as have been most fully developed. More or less prospecting has been done over a distance of 5 or 6 miles in a south-westerly direction, but no work has been done so far as I know. On several tracts within that distance tin ore has been found on the surface. On the Clarke tract, containing about 1200 acres, and on the adjoining tract of Mr. J. B. Robertson, about 750 acres, several veins have been located, and the surface ore shows a fair percentage of tin by the ordinary tests. I also hear reports of valuable finds even much further on, but have no knowledge of the facts.

After a protracted and very careful personal inspection, I am fully convinced that the area I have particularised above is an exceedingly valuable body of tin ore land. The metal is there beyond a doubt, and a little home enterprise with some home capital is all that is wanted to establish an industry which will be worth millions to those who embark in it, and millions more to the State at large. In Cornwall, England, a vein of tin ore 3 in. in width is carefully worked, and ore which yields less than 2 per cent. of metallic tin is lifted from a depth of 2000 ft. below water level with a profit. If that sort of work would even pay expenses, what cannot be done in the mountains of Rockbridge and Nelson? W. B. Robertson.

Lynchburg, Va., Sept. 4.

THE GUAYANA GOLD MINES.

Sir,—Some words about the gold fields of Guayana, written on the spot and based on concientious inspection, not by a mining engineer but by a practical man who has occasion to see and know everyday what is going on! We have hesitated to publish something; our friends told us this would be going against the stream, that people do not like to hear the truth in these operations, and that it would be to the benefit of the soil where we live to maintain them in illusions, which would bring pounds, and that something at least might flow into our pockets. We are nevertheless of other opinion, our mines are recommended by themselves, no more evidence is required than the celebrated Old Callao Company, and the no less rich companies of Chile and New Potosi; the former gives exorbitant dividends monthly, and the other two will very soon fully satisfy their shareholders. We have rich mines, and it is inconvenient to induce people to invest their money in lands where mines never have existed so far, and, as a reaction in these transactions cannot fail, we think it unjust that the good ones should suffer with the bad ones. Our information goes against so many futile publications made in England and France, which we are sorry to say are too often of a speculative character. We should gladly support anything published in London by Venezuelans if it would bring information about the transactions effected in London with regard to our mines, about the position of the different companies interested therein, about the probability or improbability of raising capital when required; we thought that we would hear something of interest of what might take place in the London market, but we have been entirely misled, because the sole reference to our mines is only to what takes place in Venezuela, and we must confess that, living in the country, these publications have lost the interest for us, and more so as they, in some cases, contain what we intend to contradict.

The New West Callao Gold Mining Company is said, in England, to take the first place. It is one thing to live here, to study and observe with interest the various companies that have sprung up, and another thing to live in London and to receive only reports which, when written by mining engineers expressly sent out, are too often exaggerated or bought at a high price, or when given by correspondents are too often untrue. It is not so very easy work to be well informed of our mines, though there exist so far only five companies worth naming. Prudent managers do not everybody allow to inspect their doings, and people living even in the same village do not know when the gold train leaves, what number of ounces it takes from Callao, Chile, &c., and less all know the position, the richness, and progress of the vein. We think the merits of New West Callao have been exaggerated, and we repeat it is a pity for our mines to be put in miscredit by exaggerated reports when our mines are of sufficient intrinsic value if properly chosen and worked. We must here repeat the words of "Panglos," referring to these mines in the *Mining Journal*, Aug. 9: "Now breaks a piston rod, then the crusher." Now the timbering gives way as in Callao Bis, and this will continue while the money last, after this the whole will crack together. Reference is made also to another mine—the Alianza. The Cicapra district has produced thousands of ounces of gold, but only the so-called "greda" found in pieces, and many thousand of ounces are buried still in the ground which soon would have been taken out if this unfortunate company never had been thought of, which, now broken down as it is, without hopes to recover, puts difficulties to thousands of workmen who willingly would continue to wash the gold as they did when they discovered the district. The country has no benefit of the Alianza, and never will, but it would have large incomes if this place would be given free again.

We have no interest to hear of broken down companies, we should like to hear about those companies which have given results, and which will soon render splendid results—they are English companies—we believe they must have all our attention, we cannot expect English capitalists will expose more money in new enterprises before the existing have not become dividend-paying companies; when this has been realised we can expect to go on. The New Potosi Mining Company will be a success, there is no doubt about it, if they continue in the present way as they have begun; their mine is rich, and only requires further development. The Chile Gold Mining Company, we are not afraid to be denied if we state, is the second in the country, and will if not equal Old Callao—that Callao with 15,000 ozs. gold monthly—at least come half the way soon. This rich company has produced as much as 3700 ozs. in 26 days, and if in later months the production has not been as good this must be mostly attributed to circumstances which we are not authorised to state; the mine is in splendid order, and with the new management will prove that the quartz is richer than hitherto. The well-known Cenicero shaft has a splendid vein wide and rich, and as soon as some works are finished will alone give sufficient material for the mill with much gold. The old abandoned Potosi shaft, of which large amounts of gold have been extracted, and which now are in possession of the Chile Company, are connected with their works, and will soon give very good rock. Only a few thousand pounds are required to push on their works, and shareholders may be sure to earn large dividends. Nacupai and Panama are likewise known as rich. Subscriber.

Guayana, Venezuela, Sept. 10.

LAKE SUPERIOR NATIVE COPPER COMPANY.

Sir,—Permit me to call the attention of such of your readers as may be interested in this company to the silence which has been kept for some months past respecting operations at the mine. The directors in their circular of June 9 intimated that they had employed Mr. George G. Francis to report on the property, and that his report was expected before the issue of the next (July) circular. Mr. Francis returned to England by the Parisian, which arrived in Liverpool on July 6, but his report has not yet been made public, the circular of July 7 being merely to the effect that it was absolutely necessary to raise 10,000*l.* immediately to prevent operations being suspended, and inviting subscriptions for debentures. As the expenditure of the company for the nine months from October, 1883, to July, 1884, has apparently been 24,400*l.* it is evident that if rock containing 1 per cent. of copper had been milled continuously for that period there would have been a loss; but the actual quantity of dressed copper and copper ore produced and shipped has been 19,600 lbs., worth not more than 500*l.* This large expenditure is somewhat incomprehensible, if we may judge from the progress made at the mine, the position there being much the same at the date of the last report (June 28) as it was a year ago. From Aug. 1, 1883, when Captain Williams reported that, with the exception of two boilers which were then on their way, he had every requirement on the mine to June 28, his reports may be summed up as waiting for machinery, jigs, or cordwood. Now, as the Chairman stated in December, 1882, that the very best machinery had been obtained, and that the treatment of the mineral would be simple enough, we can only come to the conclusion that, notwithstanding so many assurances of its existence, copper in paying quantity has not yet been found on the property.

The report of Captain Williams, of Feb. 11, seems to bear this out, and to show the machinery, when treating copper-bearing rock, to be quite adequate to save all the copper present. He says—"Averaging the last five hours' run we are producing a little over 1 ton of copper of 85 per cent. per 24 hours. The waste is very poor, only showing a trace of copper in the assay." Under all the circumstances, the shareholders would seem to have reasonable grounds for complaint that the large expenditure (87,000*l.*, including 10,000*l.* of debentures) has yielded such a miserable result. R. Meikle.

Altrincham, Oct. 15.

CHONTALES, AND ITS PROSPECTS.

Sir,—The second month's report of our golden harvest (the wet season) has been received, with the same result as the last month, and in accordance with the whole of the wet season last year—not one single ton of ore crushed, which is unprecedented in the annals of the Chontales Mine. Our manager, Mr. White, went as a stranger to the property, and was told he would not be able to find ore to crush, yet he increased the quantity crushed by the former manager considerably, and made profits. Since then it has been deemed necessary to send Mr. Bell-Davies, to whom a payment of 1000*l.* was made, to form an opinion of the property, and to advise what portions were most desirable to be worked. At the same time Mr. White had had an opportunity of making himself thoroughly acquainted with the property by plans of past operations at command, and being brought in contact with the miners who had worked the property. One portion advised to be worked first was the Consuelo, by means of a level. That was accomplished, and several thousand pounds was the result. The next portion of the property advised was the San Antonio, which in reality is the richest portion of our property, for there we have a large quantity of payable ore at command when worked, the results of the 20,000 tons formerly taken out, and the average of between 8 and 9 dwts. per ton is conclusive evidence.

The question for the shareholders to take into consideration is the manager Mr. White—is he equal to the duties imposed upon him? The next are the directors equal to the duties they have undertaken? We were made acquainted with the circumstance when Mr. White entered upon his duties that he had not had large experience in gold mining operations. It does not appear, as far as any information that I have sought to obtain, that he suggested, previous to Mr. Bell-Davies going to the mines, operations either at the Consuelo or the San Antonio. As a consequence our costs were considerable, at the mines and at home, before it was determined to work the Consuelo Mine, and now that he is working the San Antonio, at the present time, according to the etchings I have from the monthly plans received, comparing the last plan sent, which I did yesterday at the Chontales office, we are at least 210 ft. by the scale, 20 ft. to the inch, from being underneath the workings from which the 20,000 tons were taken. Reading the two last reports you are led to believe that we are at the present time under that portion of the San Antonio which was worked with such good returns. There have been delays in driving the level, and when I look through my correspondence on the subject, to the inquiries made, and the length of time already taken, there is a great inconsistency. As manager he ought to have lost no time in reaching the paying ore. One of his letters states his having discontinued working the San Antonio in consequence of no dynamite. Another states he has taken the men from the San Antonio and placed them at the Consuelo. The manner in which the Consuelo was worked during nearly the whole of last year's wet season in sinking about 35 ft. to take out comparatively a few tons of ore, and whilst working that portion of the mine that gave nearly 1 oz. 10 dwts. to the ton, the presumption is that the proximity of that portion taken out must have contained gold and a large number of tons. Yet we hear nothing of it. Again, recently, 100 tons taken out in January last, and 85 tons about May yet he does not crush it until after that date, whilst at the same time he says he had available water power, and the value of the 185 tons was worth between 800*l.* and 900*l.*—the power that he has either usurped or been instructed to use, to sell portions of our property in the reckless way in which he did, stores in particular.

As regards the directors of the old and new company, we have had their services for about 15 years without results, whilst Mr. Bell Davies has stated that results justify that the company should have been a paying one from its commencement. Mr. White's correspondence, which I alluded to at our last meeting, has left a very unfavourable impression on my mind; for a question arises—Did the directors instruct Mr. White to sell any portion of our property rather than that they should become responsible? There was one very significant remark of Mr. White's—he was glad that he had not received instructions to sell the stamps; this forms the vital portion of the property, for in the following month he had attacked the rich nail at Consuelo. This does not refer to the pneumatic stamps; but in reference to those stamps, when reading at the office the letter stating Mr. White had sold them, I at once saw Mr. Truran, and expressed my surprise; he said the directors also were surprised, and had written if possible to rescind the contract. I am of opinion that it is time for the shareholders to act—to call an extraordinary meeting. As a result, we cannot well do worse than we have done. There are three persons connected with the company who get 1000*l.* a year; every fifth year they receive an equivalent to 5 per cent. on the 100,100*l.* capital, whilst the shareholders get nothing. No one has a greater respect for the gentlemen who form the board of directors, and the secretary, J. Jameson Truran, than I have. What is wanted is practical men, a new manager at a certain salary, not 550*l.* a year, as received by Mr. White, and above the certain salary let him be paid by results, let him work for the benefit of the shareholders as well as himself, and a new manager when informed of the nature of the property at command, without doubt a valuable portion, payable and lasting, would be a great inducement to enter upon the duties.

In the Articles of Association, Articles No. 38, 39, 40, and 41, give particulars in calling an extraordinary meeting. One-tenth held by shareholders is sufficient, such meeting to be convened within 21 days. Shareholders would be able to be represented by proxies, and I should be obliged to any shareholder for his opinion, or expressed through the *Mining Journal*. W. B. Palmer.

Exchange, Bristol, Oct. 15.

THE MINERALS OF PEMBROKESHIRE.

Sir,—I notice in the *Mining Journal* of Oct. 4 that a great change is taking place with regard to ore producing districts, and that very little is worked in Wales, especially ore which is found in conjunction with coal. May I be allowed to call attention to Pembrokeshire, which is quite an unexplored part in this matter. In the latest geological map no notice is taken of iron ore, only a range of igneous rocks is shown. Hereto I add an analysis of manganiferous ironstone given by Mr. Merry, of Swansea:—

Ore dried at 100 per cent.

Insoluble residue principally silica	1·06
Peroxide of manganese	28·80
Protoxide ,,	25·65
Peroxide of iron	31·41
Protoxide ,,	Nil.
Alumina	1·50
Lime	1·17
Sulphur	·22
Phosphoric acid	·10
Carbonic acid	6·00
Combined water and loss	5·09

(Signed) J. S. Merry, Swansea.

This was picked up by myself near an open furnace heap where the Romans had evidently been at work in the parish of Ambleston.

St. Gabriel's Vicarage, Oct. 10. D. H. Francis.

CORNISH MINES AND METALS.

Sir,—About three months ago you kindly inserted some remarks of mine on the above subject. At that time foreign tin was about 85*l.*, and the Dolcoath black tin was 44*l.* per ton. In February, 1882, foreign tin was 117*l.*, and Dolcoath black tin 65*l.* per ton. So that from February, 1882, to August of the present year foreign tin fell 32*l.*, and Dolcoath black tin 21*l.* per ton. I have not noticed the shillings and pence, but my figures are practically correct.

In my letters to which I allude I confidently predicted on rational grounds that tin would continue to fall in price and largely, so that a complete collapse would take place of the Cornish industry of tin mining. Like those of all other prophets my warnings passed unheeded, and the predictions of a speedy rise in the price of tin and also lead and copper have been repeated week by week, only to be week after week utterly falsified. During the present year Dolcoath black tin has fallen from 52*l.* last December to 49*l.*, and to 44*l.* per ton in August last.

Practically tin is 10*l.* per ton lower than it was in August, and, therefore, Dolcoath black tin will not now be probably higher than 38*l.* per ton. Supposing that they raise and sell as much tin this quarter as last—that is, 593 tons—the drop will take 593*l.* × 6, or 3558*l.*, out of the quarter's profits; and with a futher fall of 10*l.* per ton on tin only one Cornish tin mine will remain paying costs. Improved machinery, reduced dues, and lower wages are as dust in the balance, and the free importations of tin will leave Cornwall a scene of the Free Trade desolation, wrought by John Bright and the Cobden maniacs.

As I have before said the only hope for Cornwall lies in fair Protection. Indeed that is the only course which can save the nation itself from insolvency and anarchy. Working men will not always suffer their employment—their wages and their daily bread—to be given to foreign workmen, as is now the case. It is ludicrous, but at the same time painful, to read the often-repeated promises of better times, better prices for metals, &c., whilst the plain and evident causes which have dragged the price of lead and copper down to zero are in like manner reducing the price of tin to the same profitless level. At 73*l.* per ton tin has not reached the lowest point. The drop of 10*l.* per ton which I predicted has come even sooner than I had anticipated.

During nine months of the present year the importations of Straits tin have exceeded those for the same months of last year by over 3000 tons, and as any amount of slave labour can be employed at the Straits the importations will go on increasing, whilst their profits are so enormous that they can do well even at a price as low as 50*l.* per ton. No wonder the tin market is unsettled, and many sellers are eager to realise before bad becomes worse. I notice that those who show the prospects of tin mining in their true colours are stigmatised as "bears." I am neither "bear" nor "bull," but I predicted exactly what has taken place three months ago, as my letters remain to of show. Anyone else might have foreseen the evident collapse of the tin trade, but the fact is that those who affirm that Protection is dead and buried, and a return to it is impossible, have their brains dead and buried also. The true Cobdenite has only one idea, and he makes much of it.

I see some rumours about France adopting Free Trade; I mean the sham we have adopted under that false name. True a nation may go mad, or we should not be existing under our boasted tariffs; but France commercially is not likely to become insane as England has, however she may delight in her glory craze. I hope I may prove a false prophet for the sake of the thousands of poor miners, whom I fear will have to look for work, wages, and bread this winter elsewhere than in their native land.—*Oct.* 11. Reciprocity.

Canadian Phosphates.—The phosphate industry of Canada is still growing in importance. We learn from the Canadian Mining Review that when the balance of the outputs from the mines of the Ottawa county have been forwarded across the Atlantic it will be found that the shipments will exceed this season the output of any former years, while at the same time the quality of the phosphates is better than has ever been produced before. Before the close of navigation it is estimated that 23,000 tons will have been sent forward. Of the mines in the Du Lievre district the Little Rapids Mine, in the First Range of Portland East, has been carefully and thoroughly worked into shape for permanent mining on a mining-like system. Encouraging results have followed on drifting on the veins at different levels in the shafts, and extensive bodies of phosphate of a superior quality have been exposed. The discovery of an unknown body of mineral on this property has lately been made, which will add considerably to its value. The other mines in the district are also being satisfactorily developed, and nothing could be more encouraging than the reports received from them. Although prices have not ruled high, mineowners have every reason to be satisfied with the past year's operations. The low rate of freights at the opening of the season, and now just before its close, has enabled shippers of phosphate to realise $17 to $18 a ton at Buckingham Station, equivalent to 100 per cent. profit all round on the cost of mining and transportation to that point. From the Perth and Kingston districts there is a slight falling off from former years. Next year's prospects are very bright. During the past few months preparations have been going on for the permanent mining of many valuable properties in the County of Ottawa. The phosphate deposits are attracting the attention of English, European, and American capitalists, hardly a day passing but what some foreigner arrives to investigate matters with a view to acquiring mining rights; and it is probable that before next year's output commences to move a large amount of foreign capital will be invested in the district. There seems to be no reason why property owners who have not the means to engage in mining themselves should not use foreign capital, which could readily be obtained for the more rapid development of the industry. To what extent it can be developed may be judged from the fact that in the Charlerton district it has been found necessary to form a Phosphate Miners' Exchange, for the better regulation of business. Several members of the British Association visited some properties in the district before returning to England, and Professor Dawkins, one of England's greatest geologists, whose opinion on all matters relat-

ing to practical mining is much valued, has expressed himself very much pleased to find that Canada possesses such extensive deposits of so valuable a mineral. His opinion, based on what he saw at the Little Rapids Mine, is that mining has not yet reached a depth at which even much larger bodies of phosphate than what he saw might reasonably be looked for. That he should have formed so favourable an opinion of the prospects for the future is very gratifying and encouraging to miners.

FOREIGN MINING AND METALLURGY.

Merchants' iron has continued to be quoted at 6*l.* per ton upon the Paris market. No. 2 ordinary plates have been in pretty good demand. Sales have been made for consumption at 7*l.* 12s. per ton; in the case of important transactions business would be done at 7*l.* 8s. per ton. This latter price is by no means a brilliant one, as it is the equivalent of about 6*l.* 12s. per ton in the Nord. For the moment, the consideration of profit appears to be relegated to the second place, and some firms seem to think principally of employing their workpeople. Other producers are, however, seriously asking themselves whether it is possible to continue working upon the conditions now prevailing, and whether it would not be better to suspend operations for a time. Some small orders have come to hand in the Department of the Nord, but large transactions are carried through with difficulty. In the Rhenish provinces and in Westphalia a little more activity has been noticed during the last few days in the demand for pig; but, supplies having been laid in until the close of the winter, prices are not likely to improve. Iron has not been very actively dealt in in Westphalia, but prices have shown a firmer tendency, and buyers have had to pay a little more in the small transactions concluded. The output of pig now being effected by the blast-furnaces of Upper Silesia is about 35,000 tons per month.

There are still complaints in the Belgian Iron Trade of an insufficiency of orders, and it is beginning to be asked why, in view of the present precarious condition of Belgian industry, the Belgian Government does not press forward vigorously with the construction of small local railways. By doing so it is obvious that the State would obtain the ironwork, which it requires upon easy terms, while industrials would be greatly benefited just now by any orders which might be given out. Meanwhile feebleness is the prevailing feature of the Belgian iron markets; prices have certainly not experienced any official change, but concessions are the order of the day as well with regard to pig as with regard to iron. An exhibition of the products of labour is to take place next year in the Palais de l'Industrie, at Paris. This Exhibition is being promoted by M. Dueret, President of an organisation known as the Syndical Chamber of Miscellaneous Industries. The French Government has accorded its patronage to this Exhibition, which will be of an international character. A Belgian section will probably be formed in connection with the Exhibition. The imports of iron minerals into Belgium in the first eight months of this year are officially returned at 1,034,940 tons, as compared with 1,053,507 tons in the corresponding period of 1883. The exports of steel rails from Belgium in the first eight months of this year were 35,690 tons, as compared with 41,470 tons in the corresponding period of 1883. The exports of iron rails were 13,709 tons and 6330 tons respectively.

In connection with the recent letting of contracts for coal required for the Belgian State Railways, it is noticed that the prices offered were generally lower than those which have been obtained during the last year or two. It was further observed that the collieries of the Couchant du Mons took part in the adjudication rather less actively than those of other districts. Prices have not experienced much change in the Belgian coal markets during the last few days. The collieries producing household coal have shown no great eagerness to conclude transactions, as they look for the usual advance incident to the commencement of winter. Coke has been weak at 10s. 6d. per ton; the demand has been better at Liége than in other neighbourhoods. The imports of coal into Belgium in the first eight months of this year are officially returned at 778,551 tons, as compared with 804,518 tons in the corresponding period of 1883. In this year's total of 778,551 tons, German coal figured for 264,372 tons, English for 165,742 tons, French for 56,318 tons, and Dutch for 292,094 tons, leaving only 25 tons imported from other countries. The imports of coke into Belgium in the first eight months of this year amounted to 23,029 tons, as compared with 23,293 tons in the corresponding period of 1883. The exports of coal from Belgium in the first eight months of this year were 2,894,542 tons, as compared with 2,696,183 tons in the corresponding period of 1883. In these totals the exports to France figured for 2,724,054 tons and 2,507,114 tons respectively. The exports of coke from Belgium in the first eight months of this year were 566,538 tons, as compared with 678,238 tons in the corresponding period of 1883.

Turquoise Mines and Pearl Fisheries of Persia. — The United States Minister at Teheran says that turquoise mining has for ages been an important source of wealth to Persia. There appears to be no historical record of turquoise mining in Persia before the 10th century, but after that the industry seems to have rapidly developed. The mines which are now in operation are the same as those worked 800 years ago, and are situated in Kerman and Khorassan. The former are now almost abandoned, the light green colour of the stones found there fading easily, and being but little prized. The mines of Khorassan are near Nishapoor, and are of great depth. Access to them is very difficult. The number of small or seed turquoises of light tint found in these mines is enormous. Mr. Benjamin states that last January 1½ lb. of the better grade of second-class stones were sold in Teheran for about 7*l.* sterling. Stones of a dark sky-blue tint are comparatively scarce. The best turquoise mines in Persia, and, indeed, in the world, are at Aboû Riâh. All the mines of Khorassan are farmed by the Mohpered Dowlet, the Nasiré Dowlet, and one or two other officials connected with the Government. For this privilege they pay 18,000 tomâns annually to the Shah, a sum equivalent to about 6000*l.* sterling. The best stones are sent to Europe, and there is at present no evidence of exhaustion in the Persian mines. The pearl fisheries, on the contrary, appear to be in a languishing condition. Formerly a very large source of revenue, they are at the present day probably not worth to the Government more than 50,000 tomans, or 16,000*l.* per annum. The pearl beds are farmed by the chief men of the adjacent towns, and, instead of being distributed in Persia, are for the most part sent to Europe by the steamers plying to the Persian Gulf. The reason for the present condition of the Persian pearl beds is that they have been allowed no rest, but have been constantly worked. In Ceylon, the pearl oysters are allowed a rest for intervals of two years, during which they are allowed to mature. Mr. Benjamin says there is reason to believe, however, that the beds at the island of Karâk, near Bushire, which have not been worked for some time, are now in a condition to repay capital expended there, especially if diving is extended to a depth of 50 to 60 fms. As the ordinary depth reached by pearl divers is rather less than this, the Persian Government have recently sent to England for diving dresses of the latest invention, and an experienced diver has been engaged at a high salary. With the assistance of these, it is expected that the pearl fisheries of Persia will regain their former importance.

Serious Decrease of Employment in the Engineering Trades.—The returns of the Amalgamated Society of Engineers for the past month show a serious decrease in the demand for employment, which may almost be described as a sudden collapse. For the last three or four years there have not been so many members thrown upon the books as out of employment in any one month's returns, and the average of members in receipt of donation benefit has risen from about 3½ to 5½ and 6 per cent. In all the shipbuilding centres trade is reported as extremely bad, and it is only in a very few exceptional cases that districts report trade as good. Even in branches which have still a fair amount of work in hand, such as locomotive building, men are being suspended, which is an indication that there is not a flow of new orders coming in to keep works fully employed. Tool makers are kept fairly employed, but in this branch also there is a curtailment of new work, and many even of the best firms are dispensing with all hands above their regular minimum staff.

COMPARATIVE MERITS OF SAFETY-LAMPS.

At a meeting of the North Staffordshire Mining Institute, held at Stoke-upon-Trent on Monday evening (Mr. John Strick presiding), Mr. A. R. Sawyer, Assistant Government Inspector of Mines, who was unable to be present, communicated a short paper which was supplementary to one formerly read by him on the subject of lamps, and noticed in the *Mining Journal*. Mr. Sawyer said he thought it necessary to refer to Mr. Marsaut's discovery that if safety-lamps were elevated into unmeasured mixtures of Bessege's illuminating gas and air, and then lowered again an internal explosion would take place, which might communicate a flame to the body of gas under examination, and that the chances of its doing so with the Belgian Mueseler were as 1 to 60. These external explosions could not be communicated to the outside gas in Paris. Whether fire-damp like Paris illuminating gas was proof against these internal explosions or not was a matter of great importance. He had used the Belgian Mueseler for detecting firedamp almost daily for the last six years, and had only seen gas flash within the top gauze twice, followed by immediate extinction. During the two series of experiments which he had recently conducted, and which he had purposely allowed the fire-damp to flash in the lamp, he did not once see this flash pass the horizontal gauze into the top gauze. It appeared to him that the way in which these internal explosions were made to communicate the flame to the outside gas was not one resorted to in practice for the detection of fire-damp. In practice lamps were not elevated into the fire-damp and lowered again, but they were elevated very slowly towards it, and as soon as the slightest cap was perceived in the flame the lamp was withdrawn at once. It was against sound practice to flash gas in a lamp unnecessarily, though there were cases in which fire-damp would flash without showing a cap. Such cases were comparatively rare, and peculiar to some seams like the Bowhurst, at different times. In the first series fire-damp flashed in the Mueseler 33 times. It showed a distinct indication of its presence in all but six experiments in the first series, three of which were accompanied by a report. In the second series the fire-damp was allowed to flash 29 times in the Mueseler. It rarely did so without being preceded by a cap or a draw of the flame. The Marsaut and the Davy, on the contrary, flashed without any or a very slight previous indication. He thought there could be no doubt that the Mueseler of all lamps took in gas at the highest level in a reduced quantity, and did this before having to be elevated into the gas. Consequently, if there was any risk attending a flash in the lamp underground the Mueseler was the last lamp which need be exposed to that risk. Mr. Marsaut's discovery would have the effect of still further discountenancing any voluntary flashing of gas in a lamp during examination. It gave an explanation which was already ingrained in all responsible officials. In connection with the neutral stratum at the bottom of the lamp mentioned by Mr. Marsaut (experiment 51 and 70, second series), would be interesting. In both of these experiments the gas flame came down to the bottom.

Modern Blast-Furnace Practice.—At the meeting of the South Staffordshire Institute of Iron and Steel Works' Managers, at Dudley, on Oct. 11 (Mr. Moses Millard in the chair), Mr. William J. Hudson (the President) read a paper "A Few Notes on Modern Blast-Furnace Practice," in which he traced the history of the smelting of pig-iron from the earliest times down to the present, and touched upon the difficulties which had attended its development. After remarking upon the utilisation of the waste gases Mr. Hudson dealt with the increased productive power of the modern blast-furnace. This was, he said, due to its increased cubic capacity, the application of hot blast, and more highly compressed air. The experiment of increasing the height of the blast-furnace had been first tried by Messrs. Oakes and Son, and had since been copied with satisfactory results. With the hot blast, 100, there was a great saving in fuel, and the Cowper regenerative stove for the heating of air was the first and the best appliance of its kind. In conclusion, Mr. Hudson held that a very powerful aid to successful blast-furnace practice was a knowledge of the theory of that practice. The furnace was a huge laboratory, in which were conducted intricate chemical actions independently and jointly influencing general results. A knowledge of these actions, and of their effects, would necessarily influence the policy of a blast-furnace manager, and enable him, when extraordinary symptoms were exhibited, to arrive quickly at the causes and the needful remedies.

In the discussion which followed Mr. J. Phillips stated that he knew that it was the opinion of some of the experienced ironmasters of South Staffordshire that by keeping the large material between the tuyeres the furnace worked more regularly. Mr. M. Grazebrook asked whether when a bell and cone was put on to a furnace, together with an increased pressure of blast white iron was produced. Mr. Hudson replied that he had known bells to have been introduced without white iron being a feature of their introduction.

Mr. Walker remarked that about 12 months ago his firm had put a bell on one of the furnaces, but without increasing the height as recommended. What they found was that it did not conduce to the production of grey iron in the slightest degree. As to the filling of the furnace they placed all the lumps at the side. The gases were all got off, or nearly so, but the furnace did not work so well.—Mr A. E. Cowper: Perhaps you compensated for the less height by using more coke.—Mr. Walker: Yes.—Mr. Hudson, in answer to another question by Mr. Walker, said it was very likely that iron could be made at almost any height.—Mr. Walker said he meant that the height of a furnace was not by any means a criterion. In some cases the materials had not the time to regulate themselves. Iron might be made at 20 ft., but the fuel would have to be enormously increased.—Mr. A. E. Cowper: Not only must you increase your fuel enormously if you drop to 20 ft., but you must work very slowly.—Mr. R. Edwards asked Mr. Hudson's opinion as to the merits of the different types of furnace. Was there better iron made with the open or the closed top?

Mr. Hudson replied that at the Woodside Works, Dudley, they had worked two furnaces, one open topped, and the other close topped. Identical loads of coal, coke, and stone had been used, as likewise the blast from the same stove, and when the iron was made he could not tell the slightest difference. He had tested the product frequently mechanically as well as by the eye. Mr. Cowper's opinion of Mr. Hudson's paper was that it was a most excellent one; indeed, one worthy of the Institute, which he hoped would be proud of it. Mr. H. Parry stated that there were many anxious enquiries being made about the latest improvements, and there was a very anxious desire to participate in them. They knew that in Staffordshire times were bad, and it was a difficult matter to revolutionise their plants, and there could be no doubt that that accounted in a large measure for the only gradual improvements which were being adopted.

Institution of Engineers and Shipbuilders in Scotland.—The Transactions for the 27th session—1883-84—forming the 27th volume has just been issued—Glasgow: Munro, Gordon-street—and contains the address of the President (Mr. James Reid); the discussion on Mr. Joseph Moore's paper on malleable iron piping of large diameters for conveying water; and papers on the stability of ships at launching, by J. H. Biles; on Whiteford's double-lock railway chair key and fish joint, by Laurence Hill, C.E.; on the compound engine, viewed in its economical aspect, by R. L. Weighton, M.A.; on cable tramways, by Ralph Moore, C.E., H.M. Inspector of Mines; on the reliability of tests of turbines, by Prof. R. H. Thurston, of Stevens' Inst. of Technology, U.S.A.; on the properties of screw piles for iron piers, considered theoretically and experimentally, by Wm. Murray, C.E.; on fog signals, as applied to lighthouses, by G. H. Slight, jun.; and on the approximation to curves of stability, from data for known ships, by F. P. Purvis and B. Kindermann. The Transactions are carefully and ably edited by the secretary (Mr. W. J. Millar, C.E.), and are amply illustrated with well-executed lithographed plates. The Institution is in a strong financial position, and the number of members is steadily increasing, so that it has every prospect of enjoying a long career of prosperity.

ALKALI MAKERS' POCKET-BOOK.

The annoyance to the user in technical analyses of reagents of varying strength and character though purchased under the same designation is well known, whilst from a commercial point of view the inconvenience was even greater since buyers were never exactly certain what they were buying, and sellers were equally at a disadvantage from being unable to quote prices, and supply their manufactures upon the precise bases adopted by their rivals, hence constant and unpleasant disagreements with their customers, and general dissatisfaction. To terminate the confusion the German Society of Alkali Makers decided to have a standard manual published, and appointed a committee of seven owners and managers of high reputation, and Prof. G. Lunge undertook to collect the material; the result is embodied in the invaluable little pocket-book just issued —The Alkali Makers' Pocket-Book: Tables and analytical methods for manufactures of sulphuric acid, nitric acid, soda, potash, and ammonia. By George Lunge, Ph.D., Professor of Technical Chemistry, Zurich, and Ferdinand Hurter, PhD. London: George Bell and Sons, York-street, Covent Garden—and all engaged in the branch of industry for which this book is intended will certainly appreciate the manner in which the task has been performed.

The first condition imposed upon him was, Prof. Lunge explains, to state only one method for each analytical operation for the preparation of standard solutions and for sampling the materials. Only one method was to be chosen, in order that no discrepancies might arise, which would certainly happen if two or more methods had been introduced. In selecting the one standard method the first and most important consideration was that the method should permit a certain indispensable degree of accuracy. No pains were spared to arrive at a satisfactory result in this respect. Where there was a choice between several equally accurate methods the one occupying least time and requiring least apparatus or one already widely known and employed was preferred. The author prepared a draft which, together with various suggestions from others, were fully discussed at the several meetings of the committee. These meetings were held at intervals of six and twelve months respectively, in order to give the author and his assistants time to carry out experimental researches to clear up any doubtful points. Ultimately after the complete manuscript had been circulated among the members of the committee it was agreed to on all points. The methods described are thus acknowledged by the united voice of the German alkali and ammonia manufacturers as the most suitable, and are not the arbitrary choice of the author. Many of the processes, the description of which frequently only occupies a few lines, are the result of many a month of arduous labour, and of subsequent anxious discussions by all concerned.

The want of standard tables of specific gravities of various solutions, was, he continues, felt quite as much as the want of standard analytical methods. For some substances such tables had never been constructed, and for very few substances indeed were the data provided to reduce the specific gravity of the solution to a normal temperature. The author and his colleagues have striven to remedy this defect by a careful examination of the existing tables, and by supplying new ones where required. In addition a number of general tables useful to alkali manufacturers have been provided. Every care has been taken to ensure the accuracy of these tables, many of them, particularly those referring to atomic weights, percentage, composition, and analytical factors, having been entirely recalculated. The German edition, the small compass of which but little betrays the labour expended upon it, was issued with the expectation that it would be accepted as a standard work by all German alkali manufacturers, by their customers, and by commercial analysts. This expectation has already been realised in a great measure. It has already become customary to make these analytical methods and specific gravity tables binding in all transactions between buyers and seller until the progress of science necessitates the substitution of more accurate methods and tables in future editions.

The general tables, of which there are 33, are evidently prepared with the greatest care, and furnish in 70 pages all the information the practical alkali maker is likely to wish to refer to, and there is then a series of special tables adapted particularly to fuel and furnaces, the sulphuric acid manufacture, salt cake and hydrochloric acid, bleaching powder, and chlorate of potash manufacture, soda ash manufacture, sulphur recovery, nitric acid manufacture, potash manufacture, and ammonia manufacture. In an appendix full details are given as to the preparation of standard solutions, rules for sampling, and so on; so that on the whole the work is as compact, useful, and instructive as could be desired.

MINERAL RIGHTS IN CANADA.

Some misunderstanding appears to have arisen in Canada with regard to the mineral rights, although it is probably attributable merely to differences upon matters of form. The minerals were reserved to the Provincial Governments, but it would seem to be to the advantage of all that the Dominion Government should deal directly with the miners, leaving the matter of account to settlement between the Dominion and Provincial Governments upon the bases already fixed. Some disquietude, says the Canadian Mining Gazette, has for a long time existed among British Columbians from the fact that a large portion of the mineral deposits in that province comes within the railway belt, and it has been feared that the Canadian Pacific Railway Company would gobble it up. In commenting on the subject the Victoria British Colonist remarks that the public may rest secure in the assurance that the rights of the province to the minerals within the railway belt will be conserved by the Government. It is now no secret that the Dominion Government have laid claim to the rich deposits of future wealth and greatness comprised within the belt. By the 109th section of the British North America Act, all lands, mines, minerals, and royalties belonging to the several provinces are secured to them in these terms:—

"109. All lands, mines, minerals, and royalties, belonging to the several provinces of Canada, Nova Scotia, and New Brunswick, at the Union, and all sums then due or payable for such lands, mines, minerals, or royalties, shall belong to the several provinces of Ontario, Quebec, Nova Scotia, and New Brunswick, in which the same are situate or arise, subject to any trusts existing in respect thereof, and to any interest other than that of the province in the same.

"And section 11 of the terms of Union the province agrees 'to convey to the Government, in trust, to be appropriated in such manner as the Dominion Government may deem advisable in furtherance of the construction of the said railway, a similar extent of public lands along the line of railway . . . as may be appropriated for the same purpose by the Dominion Government from the public lands in the North-West Territories and the Province of Manitoba.' There is nothing in the extract quoted conveying the mines and minerals which, by section 109 of the B. N. A. Act, are specially reserved for the use and enjoyment of the several provinces To our mind the title of the province seems clear, and the Government would fail in their duty should they neglect to enforce the rights of the province."

In connection with this difficulty, the Gold Commissioner and Stipendary Magistrate at Shuswap has published the announcement: —Public notice is hereby given that the Provincial Government of British Columbia have not recognised the claims advanced by the Dominion Government of Canada to the precious metals within the 20 mile belt on each side of the line of the Canadian Pacific Railway through British Columbia. The provision of the mining laws now in force through the Province of British Columbia, will be enforced within the railway belt, as well as in all other places in this district by the undersigned until such time as official instructions are received to the contrary. All persons interested must govern themselves accordingly.

Professor Huxley.—We regret to learn that the President of the Royal Society, and Dean of the Normal School of Science and Royal School of Mines, is suffering somewhat severely from the effects of overwork, and has been ordered to the South of Europe for a period of complete rest and change.

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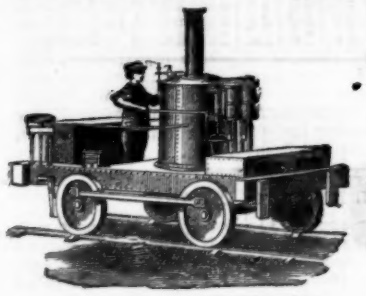

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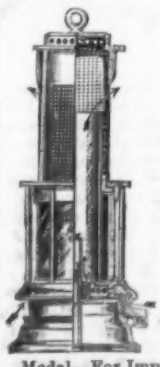

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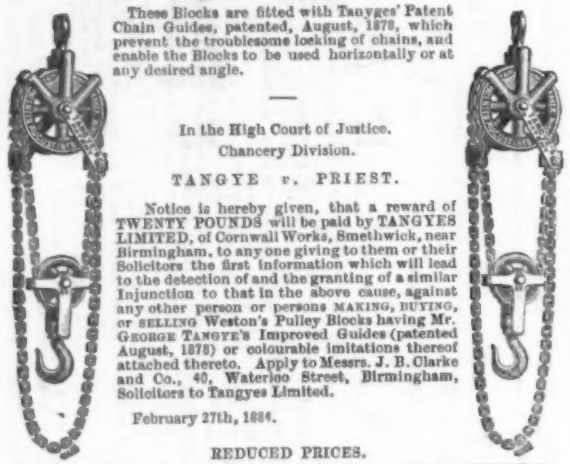

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,, ,, hand ,, ,, ,, twice height of lift. 121

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Length of chain required is rather more than four times height of lift.

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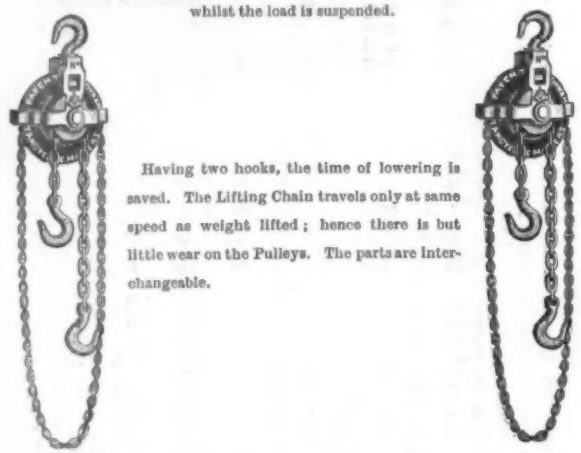
1 ,,	2 5 0	7d. ,,	5d. ,,
2 ,,	3 0 0	9d. ,,	7d. ,,
3 ,,	6 0 0	10d. ,,	7d. ,,
4 ,,	7 10 0	11d. ,,	7d. ,,
6 ,,	18 0 0	1/3 ,,	7d. ,,

The length of lift chain required is 3 feet more than double the height of lift.
,, ,, hand chain ,, 3 feet less ,, ,, ,,
In ordering state height of lift.

123

TANGYES'
DOUBLE LIFT "DYNAMIC" BLOCK.

This Block possesses the invaluable quality of not "RUNNING DOWN" whilst the load is suspended.



Having two hooks, the time of lowering is saved. The Lifting Chain travels only at same speed as weight lifted; hence there is but little wear on the Pulleys. The parts are Interchangeable.

Tested to	Price Block.	Lift Chain, with two Hooks and Hand Chain.
5 cwts.	£0 16 0	1/6 per foot lift
10 ,,	1 4 0	2/- ,, ,,
20 ,,	1 12 0	2/3 ,, ,,
40 ,,	2 8 0	2/9 ,, ,,

In ordering, state height of lift.
In case of repairs, quote number of block and letter cast or stamped on the required part.

124

TANGYES' "SELF-SUSTAINING" ROPE
PULLEY BLOCK.
(HEWITT AND GOFF'S PATENT.)

In this Block there is no abrasive action on the rope, which is merely slightly compressed by the brake.

TO LOWER. Pull down the hand rope an inch or two, which will release the brake, then allow the rope to run freely through the hand.

This Block is similar in form and construction to the London Pattern Rope Pulley Block.

In ordering state height of lift.

Diam. Sheave.....ins. / Width Groove..... ,,	2½ × ⅜	3½ × ⅝	4 × ⅝	4¾ × ¾	5 × ⅞	6 × 1
Pair 1 and 1 Sheave Blocks ..... Best Rope per foot lift	8/6 -/2	10/- -/3½	11/6 -/4½	14/8 -/5	17/8 -/7	20/- -/10
Pair 1 and 2 Sheave Blocks ..... Best Rope per foot lift	9/6 -/3	11/6 -/4½	13/- -/6	16/8 -/7½	21/- -/10	24/ 1/1
Pair 2 and 2 Sheave Blocks ..... Best Rope per foot lift	10/6 -/3	13/6 -/5½	15/- -/7	19/ -/10	25/- 1/-	27/6 1/6½
Pair 2 and 3 Sheave Blocks ..... Best Rope per foot lift	12/- -/3½	14/6 -/6	17- -/9½	21/- 1/-	27/6 1/2	31/- 1/8
Pair 3 and 3 Sheave Blocks ..... Best Rope per foot lift	13/- -/4	15/- -/7½	18/6 10/6	23/- 1/2	29/6 1/3	34/- 2/-
Pair 3 and 4 Sheave Blocks ..... Best Rope per foot lift	14/- -/5	16/6 -/8½	20/- -/11	26/ 1/4	34/- 1/8	40/- 2/3
Pair 4 and 4 Sheave Blocks ..... Best Rope per foot lift	15/- -/6	17/6 -/10	21/6 1/2	30/- 1/6	38/- 1/10	45/- 2/8

125

TANGYES'
WROUGHT-IRON ROPE PULLEY BLOCKS.
(LONDON PATTERN.)

Snatch No. 1. SNATCH No. 1A. No3. No4. No5. No6.

The Eye, as shown in No. 4, is supplied with the smallest Block of each pair ordered. The actual width of groove is from 1/16 to ⅛ more than list, so that the 16×3¼ is really 16×3⅜, and so on, to allow for new rope being larger.
These Blocks have turned shafts, bright pulleys, and are bored.
The Cross-heads are made of wrought-iron. All parts are interchangeable.

Dia. Sheave ...ins. / Width Groove ...	2½ × ⅜	3½ × ½	4 × ⅝	4¾ × ¾	5 × ⅞	6 × 1	7 × 1¼	8 × 1½	9 × 1¾	10 × 2	11 × 2¼	12 × 2½	14 × 2¾	15 × 3	16 × 3¼
Snatch No. 1 ..... Weight .....lbs.	— —	3/9 4	4/6 5	5/3 8	7/6 11	9/- 14	11/- 21	14/ 31	21/6 44	42/- 62	50/ 91	75/- 129	95/- 152	115/ 211	145/ 249
Snatch No. 1a ..... Weight .....lbs.	— —	4/6 4	5/3 6	6/6 9	8/9 11	10/3 16	12/6 23	16/ 33	24/ 46	45/- 66	60/- 93	84/- 120	105/ 164	130/ 219	160 260
1 Sheave ..... Weight .....lbs.	2/8 1	3/ 4	3/9 5	5/3 9	6/8 12	7/6 16	9/6 22	12/6 35	20/- 47	30/- 66	45/- 92	60/- 118	70/- 170	100/ 225	115/ 350
2 Sheaves ..... Weight .....lbs.	3/6 2	5/ 5	5/3 8	7/3 13	9/6 20	11/ 26	16/ 36	22/6 58	32/ 74	50/- 105	90/- 156	105/- 222	136/ 296	150 412	175/ 504
3 Sheaves ..... Weight .....lbs.	4/6 3	6/3 7	7/3 10	9/6 18	12/6 25	14/6 35	21/- 49	30/- 75	45/- 104	70/- 144	115/ 214	140/ 292	170/ 416	200/ 586	240/ 695
4 Sheaves ..... Weight .....lbs.	6/- 5	6/9 10	9/- 14	13/- 23	17/3 38	20/ 49	30/- 68	42/6 104	65/- 145	95/- 208	140/ 289	165/ 390	200/ 550	260/ 760	300/ 880
Spare Iron Sheaves ea.	-/3	/4	-/6	-/10	1/3	1/6	2/6	3/6	4/6	6/-	8/	10/-	14/	17/-	20/
Brass sheaves, ea.	1/	1/3	2/3	3/6	5/-	6/6	8/3	12/9	19/3	32/	—	—	—	—	—
Blocks will take Chain ins.	—	—	—	3/16	¼	5/16	⅜	7/16	1/2	9/16	⅝	11/16	¾	13/16	⅞

For Brass Sheaved Blocks, add price of Brass Sheaves, less that of Iron Sheaves.
For Galvanising these Blocks, add 20 per cent. to above prices.

126

TANGYES'
GIN BLOCKS OR RUBBISH PULLEYS.

GIN BLOCK.

Diam. Pulley ..... in.	2½	3½	4	4¾	6	7	8	9
Width Groove ... ,,	⅜	½	⅝	¾	1	1¼	1	1
Weight..... lbs.	1	1¾	2½	4¾	10½	13½	13	14
Price ..... each	3/-	3/3	3/6	4/-	4/6	5/-	5/6	6/-
Spare Sheaves ... ,,	-/3	-/4	-/6	-/10	1/-	1/3	1/6	1/9
Diam. Pulley ..... in.	10	11	12	14	16	18	20	22
Width Groove ... ,,	1	1	1	1¼	1½	1½	1½	1½
Weight..... lbs.	16	18	22	31	45	50	58	67
Price ..... each	6/6	7/6	8/3	9/-	12/-	14/	17/-	19/-
Spare Sheaves ... ,,	2/-	2/3	2/9	3/9	5/3	6/-	7/6	8/9

WROUGHT-IRON ROPE PULLEY BLOCKS.

TABLE GIVING TEST LOADS.

Diam. Sheave ins. / Width Groove ,,	2½ × ⅜	3½ × ½	4 × ⅝	4¾ × ¾	5 × ⅞	6 × 1	7 × 1¼	8 × 1½	9 × 1¾	10 × 2	11 × 2¼	12 × 2½	14 × 2¾	15 × 3	16 × 3¼
Cwts. per Sheave	1	3	5	7	10	12	18	27	35	48	60	75	90	105	120

RULE:—

$$\frac{\text{Load}}{\text{"Test" Load per Sheave}} = \text{number of Sheaves and size of blocks.}$$

EXAMPLE:—
A pair of 3 and 3 Sheave, ⅞ in., at 10 cwt. per Sheave will test to 60 cwts.
Or, ,, 2 ,, 3 ,, 1 ,, 12 ,, ,, ,, 5 ,,

For a slight extra charge Blocks can be tested before leaving our Works.

NOTE.—We do not bind ourselves to the exact powers given above, but they are approximately correct. In ordering, it is always advisable to leave a sufficient margin.

127

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MINING MACHINERY,
MILLING MACHINERY

Of the MOST APPROVED AMERICAN PATTERNS.

GOLD MILLS.

The California pattern of Gold Stamp Mill is universally accepted as the most perfect, economic, and efficient made.

We have over 900 stamps in successful work in the various Western Gold Districts.

SILVER MILLS.

Silver amalgamation in Pans is essentially an American system evolved after years of work on the rich silver mines Nevada.

We have over 500 Stamps, with necessary pans, settlers, roasting furnaces, &c., all of our own manufacture, at work in different silver camps of the United States, Mexico, and South America, and Phillipine Islands, Asia.

CONCENTRATION MILLS

Of the most approved German pattern and arrangement, or with Stamps and Frue Vanner Concentrators for low grade silver ores, light in lead. We have over 20 large German pattern mills at work on lead, zinc, or copper ores, and numerous Vanner mills on ores never before successfully concentrated.

Mining Pumps, Cornish pattern, of the largest sizes. **Hoisting Engines,** from 4 h.p. up to the largest direct-acting engines to sink 3000 feet.

SMELTING WORKS.

We have 80 Water Jacket Smelting Furnaces in use from 20 in. circular up to 54 in. by 60 in. for lead and silver smelting; and special High Jacket Furnaces for copper ores.

Engines of any size, plain slide valve, Corliss, compound Corliss, Boilers, all sizes. **Leaching Mills, Hallidie Wire Rope Tramways. Comet Crusher,** with capacity of 12 to 20 tons per hour. **White, Howell. Bruckner, and Stetefeldt Roasting Furnaces, &c.**

We have had twenty years experience in the manufacture solely of MINING MACHINERY, and have special facilities for shipping to all foreign parts through our New York Office, where all details of clearance, shipment, and insurance are conducted. Our machinery is already well known in Mexico, Peru, Chili, Venezuela, Honduras, and other South American countries.

Correspondence solicited. Descriptive Circulars and Catalogues on application

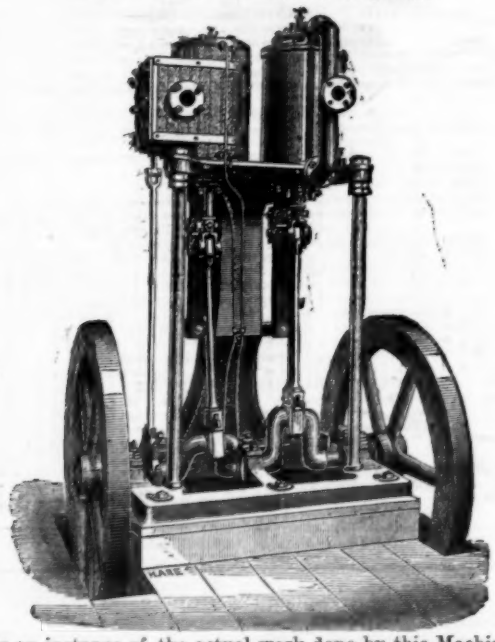
FRASER AND CHALMERS.

Principal Office and Works.	New York Office.
Fulton and Union Streets, Chicago, Ill, U.S.	No. 2, Wall Street, New York, U.S.

COLORADO OFFICE—CHEESMAN BLOCK, DENVER.

THE

"Champion" Rock-borer
AND AIR COMPRESSOR.



As an instance of the actual work done by this Machinery in various kinds of ground, some of it the hardest rock, it may be mentioned that in Cornwall, irrespective of the work performed by the "Champion" Rock-borers and Air-compressors purchased by various Mines, the drivage, rising, sinking, and stoping done by contract by the Proprietor with his own Machinery now amounts to over 1350 fathoms.

Several of these Air-compressors, ranging from 3½ to 12 tons in weight may be seen in constant work in the Camborne Mining District.

R. H. HARRIS,
ENGINEER,
63, QUEEN VICTORIA STREET, LONDON.

KIRKSTALL, BOWLING, AND STAFFORDSHIRE BAR IRON

RAILS—RAILS—RAILS—

New, slightly defective.

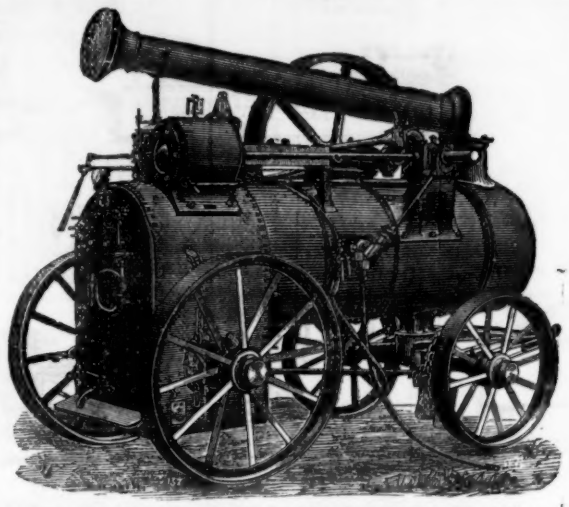
F.B. SECTION—BULL HEAD—DOUBLE HEAD—
10, 12, 14, 16, 18, 20, 24, 30, 40, 50, 60, 70, 75, 80 lb. per yard.
Sections on application to

WILLIAM FIRTH, WATER LANE, LEEDS.

POINT and CROSSINGS with all Fittings complete.
2000 tons in stock ready for delivery.

CLAYTON AND SHUTTLEWORTH,
STAMP END WORKS, LINCOLN, AND 78, LOMBARD STREET, LONDON.

☞ *The Royal Agricultural Society of England have awarded Every First Prize to CLAYTON and SHUTTLEWORTH for Portable and other Steam Engines since 1863, and Prizes at every Meeting at which they have competed since 1849.*



Steam Engines, portable & fixed,
For Coals, Wood, Straw, and every kind of Fuel.
OVER 21,500 SOLD.

Thrashing Machines.
OVER 19,500 SOLD.

Straw, Corn, and Hay Elevators.
Chaff Cutters for Steam Power.
Grinding Mills.
Saw Benches.
Traction Engines, &c.

GOLD MEDAL AND FIRST CLASS CERTIFICATE at the Calcutta International Exhibition 1883-4.
THE ONLY GOLD MEDAL
AWARDED FOR
PORTABLE STEAM ENGINES.

GOLD MEDALS AND OTHER PRIZES have been awarded to CLAYTON AND SHUTTLEWORTH at all the important International and Colonial Exhibitions, including
LONDON, 1851 and 1862;
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Catalogues in English and all European Languages free on application.

THOMAS TURTON AND SONS,

MANUFACTURERS OF

Cast Steel for Mining and other Tools, Shear, Blister, and Spring Steel.

FILES OF SUPERIOR QUALITY.

EDGE TOOLS, HAMMERS, PICKS, AND ALL KINDS OF TOOLS FOR RAILWAYS, COLLIERIES, ENGINEERS, AND CONTRACTORS LOCOMOTIVE ENGINE, RAILWAY CARRIAGE, AND WAGON SPRINGS AND BUFFERS.

SHEAF WORKS, AND SPRING WORKS, SHEFFIELD.

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POTENTITE.

This unrivalled Explosive, as manufactured by the **New and Perfected Machinery** of the Company, is perfectly safe for transit, storage, and use, and is employed in every description of Mining or Quarrying Work, for Tunnelling, Pit Sinking, Engineering Work, and Submarine Operations, with the most complete success and satisfaction.

Potentite does NOT contain its own MEANS OF IGNITION, is free from Nitro-Glycerine, and its SAFETY has been speciall demonstrated by public experiments.

Its strength is unequalled. Its action is certain.

In action it gives off neither flame, smoke, nor offensive smell. By its use labour is economised, as work can be resumed immediately after the shot is fired.

POTENTITE is specially adapted for export to hot climates, as it is unaffected by heat, and is free from dangerous exudations.

POTENTITE IS THE SAFEST STRONGEST, AND WORK FOR WORK, CHEAPEST EXPLOSIVE IN THE MARKET.

For particulars and prices, apply to—

THE POTENTITE COMPANY, LIMITED.

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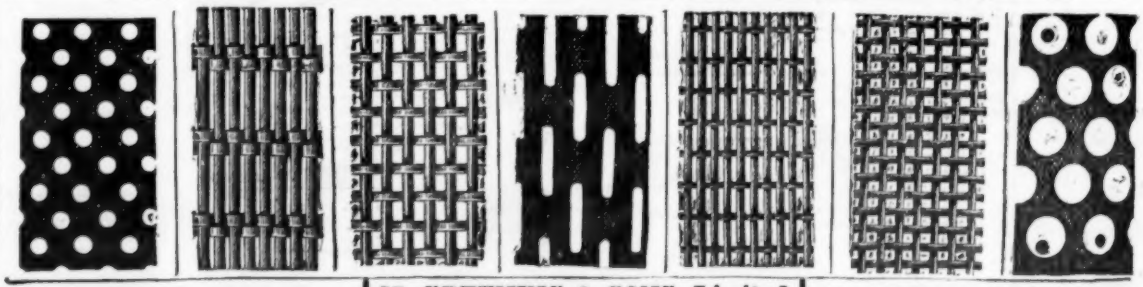


Extra Treble Strong Wire Cloth and Perforated Metals in Steel, Iron, Copper, Brass, Zinc, Bronze.

Made in all Meshes and Widths.

N. GREENING & SONS, Limited,
Wire Manufacturers and Metal Perforators,
WARRINGTON.

Jigger Bottoms, Trommels, Cylinder Covers, Riddles, Sieves for Diamond, Gold, Silver, Copper, Lead and Tin Mines.

Samples and Prices free on application.

FRANCIS MORTON AND CO., LIMITED, LIVERPOOL,

MANUFACTURERS OF

GALVANISED CORRUGATED IRON ROOFS, BUILDINGS, AND SHEDDING,

WHICH THEY HAVE EXTENSIVELY ERECTED FOR THE REQUIREMENTS OF

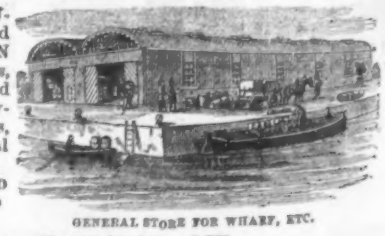
Forges, Rolling Mills, Puddling Sheds, Ironworks, and Collieries

Erected Complete in this Country, or prepared to Plan for Erection Abroad.

OPEN SHED FOR COVERING LARGE AREAS

GALVANISED OR PAINTED CORRUGATED IRON ROOFING PLATES and TILES. HEAVY CORRUGATED IRON PLATES for fireproof floors, roadways, parapets, &c. (for producing which F.M and Co. have recently laid down powerful Hydraulic Machinery). Wrought-iron Tanks, Guttering, and General Constructional Wrought Ironwork.

DESIGNS PREPARED, AND ILLUSTRATED DESCRIPTIVE CATALOGUES FORWARDED ON APPLICATION



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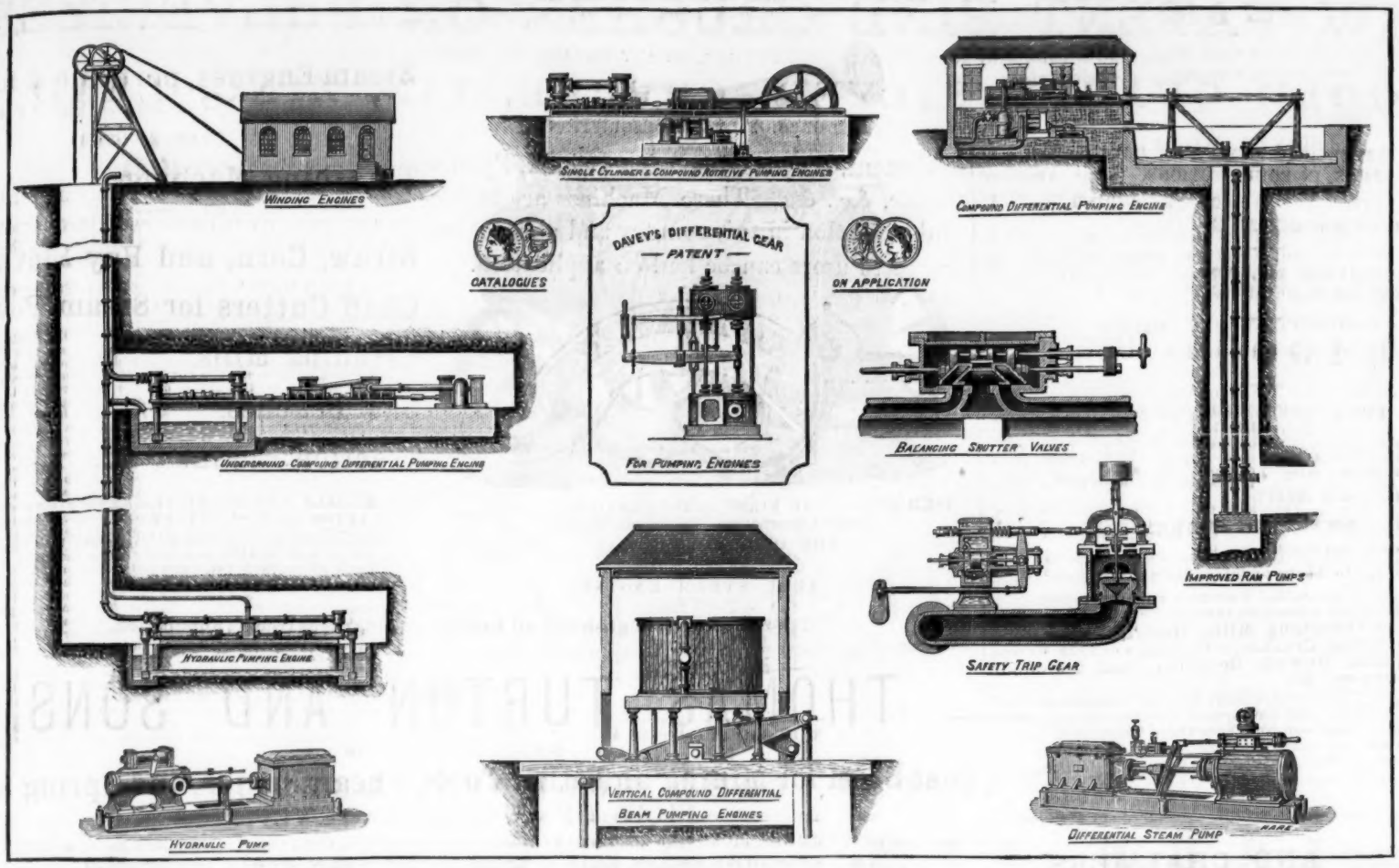


SUN FOUNDRY, LEEDS.

BELL'S ASBESTOS.

BELL'S PATENT ASBESTOS BLOCK PACKING for High-Pressure Engines

The following testimonials refer to this Packing:—

Mona Lodge, Amlwich, Anglesey,
2nd August, 1884.

DEAR SIR,—I have much pleasure in answering your note. Bad times in mining have compelled me to try all kinds of expedients in order to effect saving; some have succeeded and some have failed, but my underground manager, Capt. Hughes, has just said to me by the telephone—"The Asbestos Packing is the best thing ever brought here."

It saves money and trouble, but like my gas purifying oxide it lasts so long that you must not expect another order from me for twelve months at least.

Yours truly,
T. F. EVANS,
Late H.M. Inspector of Metalliferous Mines.

Mr. J. Bell.

Manchester, Sheffield, and Lincolnshire Railway—Steamship Department,
Grimsby, April 10th, 1884.

DEAR SIR,—I have much pleasure in stating that after a trial of over nine months, and comparing it with other packings, I can confidently recommend your Asbestos Packing. It is especially valuable when high-pressures are employed, as in cases where other packings have perished, owing to high temperatures, your packing has invariably stood well. I have also used it with complete success when a gland has heated with other packings, and also in cases of badly scored piston rods. I consider the results I have obtained by its use for our marine engines to have been in every way highly satisfactory.

Yours truly,
G. H. CLARKE, Sup. Engineer.

Mr. J. Bell.

Department of the Director of Navy Contracts,
Admiralty, Whitehall, 20th June, 1884.

SIR,—I have to inform you that your tender has been accepted for Bell's Rolled Cloth Asbestos Packing to sample submitted:—Elastic core ... ... Square.
" " ... ... Round.

To Mr. John Bell.
JOHN COLLETT, Director of Navy Contracts.

The Patent Block Packing is square, as Fig. 1 and Figs. 2 and 3 represent the Round Block Packing with solid and hollow rubber core, and Fig. 4 without core, but with rubber inlaid. As these packings are extensively imitated, and as it is a common practice among dealers and agents to supply the cheaper manufactures at my list prices, users are requested to see that the packing supplied to them bears the trade mark.

BELL'S ASBESTOS BOILER PRESERVATIVE.—This useful mixture by absorbing the free oxygen that is in the water entirely checks pitting and corrosion. It also disintegrates incrustation so immediately as to prevent its adhering to the plates. Not only is a great economy of fuel effected by keeping boilers clean, but the risk of having the plates burned is thereby obviated. It has been computed that 1/16 in. thick of incrustation causes a waste of 15 per cent. of coal; 1/4 in., 60 per cent.; 1/2 in., 150 per cent. Thus the Preservative avoids the great risks which are inseparable from scaled plates, lengthens the life of a boiler, and covers its own cost a hundredfold by economy of fuel. It is entirely harmless, and has no injurious action on metals. It can be put into the feed tank or boiler, as may be most convenient. Sold in drums and casks bearing the Trade Mark, without which none is genuine.

BELL'S ASBESTOS YARN and SOAPSTONE PACKING for Locomotives and all Stationary Engines running at very high speed with intense friction.

Sandwell Park Colliery, Smethwick, 1st February, 1884.

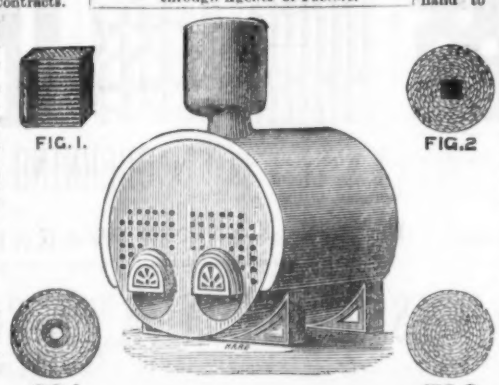
To Bell's Asbestos Works.

DEAR SIRS,—I have much pleasure in stating that I have used your Asbestos Packing for the last 13 months for our large winding engines which are running night and day, and also for the fan, pumping, and hauling engines at the above Colliery, and during that period we have not used more than one-third the Packing we had formerly; and this I attribute to your Packing on account of its great durability and general excellence of quality.—I am, dear Sirs, yours faithfully,
THOMAS WINTER, Colliery Engineer.

TRADE MARK.

BELL'S ASBESTOS.

The goods of this house are of the highest quality only, and no attempt is made to compete with other manufacturers by the supply of inferior materials at low prices. All "home" orders should be sent direct to the undermentioned depôts and not through Agents or Factors.



BELL'S ASBESTOS BOILER AND PIPE COVERING COMPOSITION, for coating every class of steam pipes and boilers, non-combustible and easily applied when steam is up; adheres to metals and preserves them from rust; prevents the unequal expansion and contraction of boilers exposed to weather; covers 50 per cent. more surface than any other coating, and is absolutely indestructible. It can be stripped off after many years' use, mixed up with 20 per cent. of fresh, and applied again. The composition is supplied dry, and is only to be mixed with water to the consistency required for use.

A Horizontal Boiler, 17 ft. 6 in. long, 15-H.P., gave the following results:—

Temperature on Plates - - - 186 deg.
" " Covering - - 94 deg.

One ton of coal was saved per week, and although the fire was raked out every evening 20 lbs. of steam were found in the boiler next morning.

The following Testimonials refers to this Covering:—

Offices of the Wimbledon Local Board, Wimbledon, Nov. 28th, 1883.

DEAR SIR,—It may interest you to know that we save exactly 46 per cent. in fuel through using your covering.

Yours truly,
W. SANTO CRIMP, C.E., F.G.S.

The Tamar and Kit Hill Granite Company (Limited),
Gunnislake, Tavistock, 8th April, 1884.

Mr. John Bell, Southwark, S.E.

SIR,—I have much pleasure in stating that the Asbestos covering applied by you to the boiler of our travelling crane at Kit Hill has yielded most remarkable results. Since it has been in use we have saved fully half our coals, and have effected a great saving in the time it takes to get up steam, which is often a matter of great importance to us. I should add that the crane runs on high gantries, and is fully exposed to all weather. I have formed the highest opinion of your Asbestos as used for this purpose, and as you are aware, have had another boiler similarly covered, though it has not since been used. I can most strongly recommend the material.

I am, Sir, yours faithfully,
W. J. CHALK, Assoc. M.Inst.C.E., Engineer and Manager.

BELL'S ASBESTOS and INDIA-RUBBER WOVEN TAPE and SHEETING, for making every class of Steam and Water Joints. It can be bent by hand to the form required without puckering, and is especially useful in making joints of manhole and mudhole doors. It is kept in stock in rolls of 100 ft., from 1/8 in. to 3 in. wide, and any thickness from 1/16 in. upwards. Manhole covers can be lifted many times before the renewal of the jointing material is necessary. The same material is made up into sheets about 40 in. square, and each sheet bears the Trade Mark, without which none is genuine. It is very necessary to guard against imitations of this useful material, and to secure themselves against being supplied with these inferior articles at my price, users are recommended to see that every 10 ft. length of the Asbestos Tape purchased by them bears the Trade Mark.

BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD, for Dry Steam Joints, made of the best Asbestos fibre, is well-known for its toughness and purity, and is absolutely free from the injurious ingredients frequently used to attain an appearance of finish, regardless of the real utility of the material. Made in sheets measuring about 40 in. square, from 1-64th in. to 1 in., and 1/2 millimetre to 25 millimetres thick. Each sheet bears the Trade Mark.

The following copy of acceptance of tender refers to above:—

Department of the Director of Navy Contracts.
Admiralty, Whitehall, S.W., 17th May, 1884.

SIR,—I have to inform you that your tender for Asbestos Millboard has been accepted.—Mr. John Bell.
JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS EXPANSION SHEETING (PATENT). This Sheeting is another combination of Asbestos with India-rubber, giving to the steam user the special advantages of both materials. The India-rubber Washer is protected from the action of heat and grease by an outer coating of vulcanised Asbestos Cloth, thus producing an excellent joint where expansion and contraction render other materials unserviceable. This material is admirably suited to steam pipe joints and every class of valve. Valves made of this material are very durable, as they are not subject to injury by oil.

BELL'S "ASBESTOS LUBRICANT."

"REGD"

ILLUSTRATED PRICED CATALOGUE FREE ON APPLICATION TO

BELL'S ASBESTOS WORKS, SOUTHWARK, LONDON, S. E.

OR THE DEPOTS—118a, SOUTHWARK STREET, S.E.,

Victoria Buildings, Deansgate, MANCHESTER. 11 and 13, St. Vincent Place, GLASGOW. 39, Mount Stuart Square, CARDIFF. 21, Ritter Strasse, BERLIN.

THE BLAKE-MARSDEN NEW PATENT IMPROVED STONE BREAKERS AND ORE CRUSHERS.

ORIGINAL PATENTEE AND ONLY MAKER.

H. R. MARSDEN,

ALSO PATENTEE AND ONLY MAKER OF THE

NEW PATENT FINE CRUSHER OR PULVERIZER,

FOR REDUCING TO AN IMPALPABLE POWDER, OR ANY DEGREE OF FINENESS REQUIRED,

GOLD QUARTZ, SILVER, COPPER, TIN, ZINC, LEAD

AND ORES OF EVERY DESCRIPTION

PATENT REVERSIBLE CUBING and CRUSHING JAWS, IN FOUR SECTIONS,

WITH PATENT FACED BACKS, REQUIRING NO WHITE METAL IN FIXING.

CRUCIBLE CAST-STEEL CONNECTING RODS. RENEWABLE TOGGLE CUSHIONS, &c.

OVER **4000** IN USE.

EXTRACTS FROM TESTIMONIALS.
PULVERIZER.

"I have great pleasure in bearing testimony to the merits and capabilities of your patent combined fine crusher and sieving apparatus. I have tried it on a variety of ores and minerals, and it pulverizes them with equal success. You can put in a small paving stone and bring it out like flour."

"In reply to your favour, I have much pleasure in informing you that the 12×3 Pulverizer we had from you is giving us every satisfaction. The material we are operating on is an exceptionally hard one. I am well satisfied with its working."

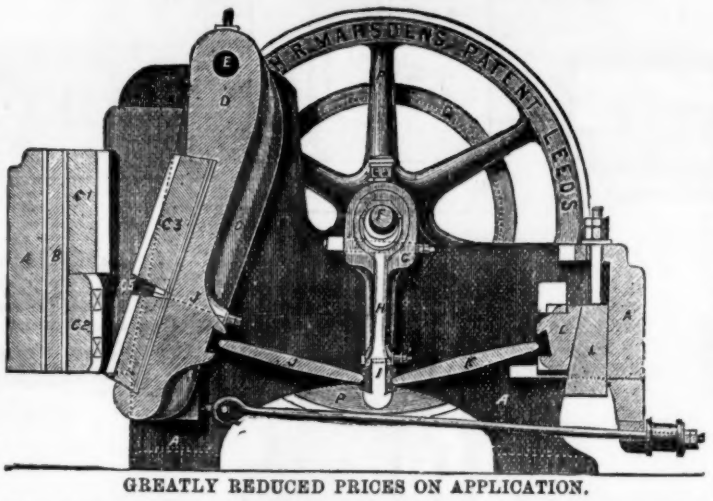
"Our experience is that the motion and mechanical arrangements of your machine are the best for pulverizing that we have ever met with."

"The reports from our mines as regards the working of your Fine Crusher (20×5) recently supplied are very favourable, although we cannot quote you exact figures. On being got into position it was tried *by hand*, with the result that it made short work of the biggest pieces of ore we put into the hopper. You might say how long you would take to deliver another of the same size."

"As I once before stated, your machine is a perfect pulverizer."

"I am sure the machine will be a success, and a great one, and there is any amount of demand for such a machine. We can work it with 20 lbs. of steam, and our engine, which is a 12-h.p., plays with the work, in fact we run the Stonebreaker and the Pulverizer both together with 35 lbs."

Also Cement, Barytes, Limestone, Chalk, Pyrites, Coprolite, &c., &c. These Machines are in successful operation in this country and abroad, and reference to users can be had on application.



GREATLY REDUCED PRICES ON APPLICATION.

AWARDED OVER

60

FIRST-CLASS GOLD AND SILVER MEDALS.

ADOPTED BY THE PRINCIPAL CORPORATIONS, CONTRACTORS, MINING COMPANIES, &c., IN ALL PARTS OF THE WORLD.

ROAD METAL BROKEN EQUAL TO HAND, AT ONE-TENTH THE COST.

EXTRACTS FROM TESTIMONIALS.—STONEBREAKER.

"I now order Three of your Stone Crushers, size 15 × 10, to be of your very best construction, and to include two extra sets of Jaws and Cheeks for each. The last two 24×13 machines you sent me, which are at work in this colony, are doing very well. You will soon find that the railway contractors will adopt your machines in preference to the colonial ones—two of which I have. I know other contractors have had as many as nine of them, which have not given very good satisfaction. Once they know of yours thoroughly, I believe you will do a good trade with the colonies. For reference of the high character of your constructions you can refer to me as having used them with the very best results, both in New Zealand and this colony, and much prefer them to the colonial article, both in point of construction and less liability to go out of order. The material we are crushing is very hard blue stone, for railway ballast purposes. Push on with the order as quickly as possible; I do not think it necessary to have any engineering inspection. I have brought your machines prominently under the notice of all large contractors in this colony, likewise the Government. Many of the contractors have spoken to me in reference to their capabilities, and I could only tell them that they are by far and away the best and most economical I ever used. The very fact of me having purchased now Eleven from you at various intervals and various sizes, and two above 12 years ago, and having tried all the other makers, is sufficient guarantee of the capabilities and the working of your machines. Yours in every way surpass all others."

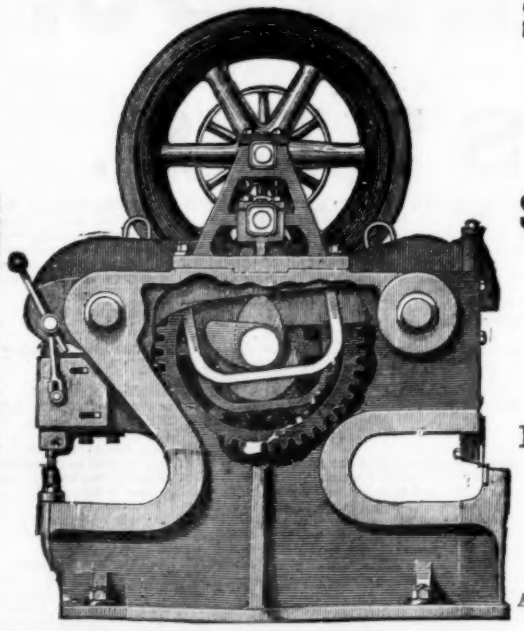
"Some of your testimonials do not give your machines half the credit due. I have seen men hammering away on a big rock for a quarter of a day which your machine would reduce to the required size in a quarter of a minute. I would guarantee that your largest size machine would reduce more of the Cornish tin capels (which is the hardest rock of England) n a day than 200 men, and at 1-25th the cost."

FOR CATALOGUES, TESTIMONIALS, &c., APPLY TO THE SOLE MAKER,

H. R. MARSDEN, SOHO FOUNDRY, LEEDS.

JOHN CAMERON'S

FLY-WHEELS ON BOTH SIDES.



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SPECIALITIES ARE HIS

STEAM PUMPS

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COLLIERY PURPOSES.

Specially adapted for forcing Water any height

ALSO, FOR

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Of which he has made over 9000.

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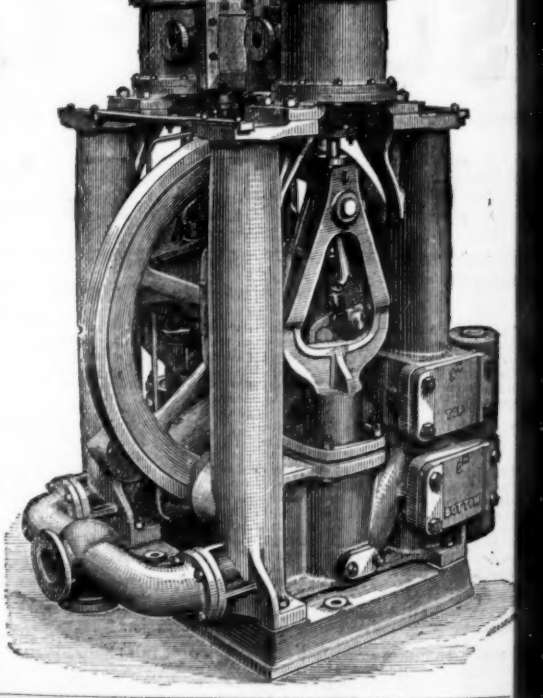

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By a special method of preparation this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

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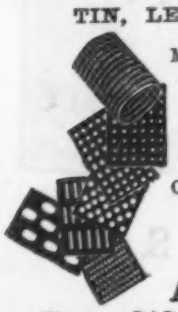
PERFORATED SHEET METALS

FOR

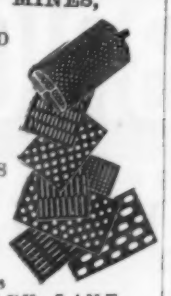
TIN, LEAD AND COPPER MINES,



MILLERS, BREWERS, AND MALSTERS,

COLLIERIES AND QUARRIES,

COFFEE ROASTERS AND SUGAR REFINERS.



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